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[ILLUSTRATED.]

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The Man who Helped Professor Morse Out of a Difficulty.

Mr. W. H. Ward, managing director of the Ward Axle, Brake and Coupling Company, of Monongahela City, Pa., gives the following as a chapter of his own experience as the advisory assistant of Professor Morse in making his first experiments. Mr. Ward says:

"In April, 1844, the start for laying was made from Washington by trying it under a process by a Mr. Cornell, of Ithaca, N. Y., himself, as the superintendent of the work, by laying the wires, encased in lead pipe, 18 inches under ground. When the first 600 feet were laid it was discovered that the recording pen, of three points, showed weakness, and with the second 600 feet additional weakness, and when the third 600 feet was added the pen refused to make legible impressions on the paper, as then used. Then the professor hastened to the Patent Office in a fever of excitement to consult with the writer what to do, for the professor frankly stated that all his hopes had now gone up, and he seemed as helpless as a wet rag. But when told to hang it up he immediately recovered his electric elasticity, sprang to his feet and went for the men who were anxiously awaiting his return to hear him say: 'The problem is solved by hanging up wires,' and it was. The next day Professor Morse and the writer se tled on the glass insulators, and for economy obtained gratis the necks of beer and porter bottles from Baltimore and Washington hotels; and at the meeting of the Whig nominating convention in May, 1844, the line was completed to the relay station, B. and O. R.R., and by June 2 to Baltimore."

Report of the Committee on Standards of Light.

BY PROF. G. FORBES.

The first communication that I have to make is the report of the Committee on Standards of Light. The Committee on Standards of Light have met repeatedly during last winter. It had been proposed in last year's report to carry on experiments on electrical standards, in the hope of arriving at an absolute standard of light. One of the first steps was to discover a means of reproducing a definite temperature, and certain experiments were proposed for this purpose. At one of the first meetings of the committee Captain Abney announced that he had already found a means of doing this in a different manner to that proposed in the committee's report, depending only on the change of the resistance of the carbon filament with temperature. Under these circumstances, the committee left this part of the experimental investigation to be reported upon by Captain Abney. His further researches, however, have led him to believe that the law which he had announced to the committee does not hold with all qualties of carbon filaments. He has, however, been engaged upon further experimental researches in the same direction, which are ready for publication, and which have an important bearing on the labors of the committee. (I may here mention, however, that he has been prevented from putting these into a form ready for publication, and that must be delayed for the present.) In the last year's report attention was drawn to the value of the pentane standard of Mr. Vernon Harcourt as a practically reproducible standard of illumination. Mr. Rawson has been engaged during the past winter, under the direction and with the assistance of Mr. Vernon Harcourt, in a further examination of this standard, and his results will be made known in a separate paper. Sir James Douglass has also made some experiments which are not quite completed, but they have gone so far as to give great promise. Some account of those experiments in this report had been expected by the committee, but the absence of Sir James Douglass on official business prevented him from completing it. At one of the first meetings of the committee the secretary showed what he had done in the way of improving thermopiles, such as it was hoped would be of use in the investigation recommended in last year's report, and he was instructed by the committee to proceed with the construction of the instrument, which has been completed, and is placed before the section and described in a separate paper. The committee respectfully request to be re-appointed, with a grant of £25.

A New Application of the Photophone.

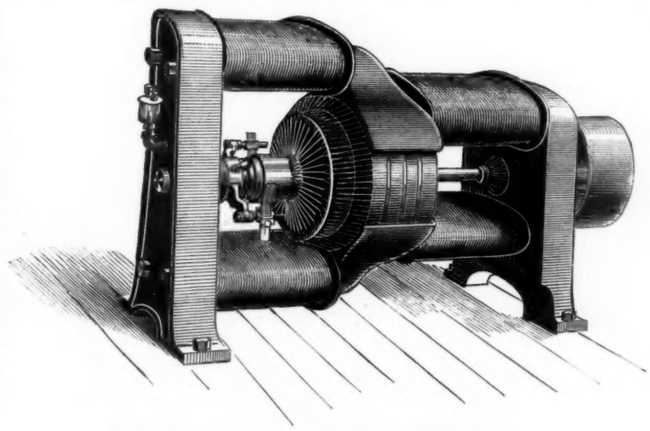
M. Leon Esquille has found it possible to employ photography and electricity together, for the purpose of recording and reproducing speech in a more direct manner than has hitherto been done. M. Esquille's method consists in speaking in the first instance to a photophone transmitter Our readers will remember that this is merely a diaphragm with a highly polished surface from which a ray of light is reflected. The record of this speech is then obtained by simply photographing the ray of light upon a traveling band of sensitized paper. After having been developed, the articulation may be reproduced by projecting the image of the trace by means of an electric arc or oxyhydrogen light upon a selenium receiver, preferably one of the form due to M. Mercadier. The speech is then heard through the telephone in the usual manner. It seems highly probable that, although this method is certainly more troublesome, it will give results superior to those of instruments which, like Edison's phonograph and Prof. Bell's more recent "graphophone," depend initially upon a mechanically formed trace of the sound vibrations.

The Gramme Ring, its History and Recent Important Improvement.

BY PROF. P. H. VANDER WEYDE

It is at present acknowledged that Gramme is not the first inventor of the ring which bears his name, and of which the introduction has revolutionized the construction of the most superior kinds of dynamo electric generators. It has been discovered that Pacinotti, of Florence, invented this ring before 1860, and in that year constructed a machine, in which it was employed, for the University of Pisa, Italy. Its description was published in 1864, while Gramme, a Belgian, in the employ of the Alliance Magneto Electric Company in Paris, constructed such a machine in 1871, when Jamin exhibited the same in the meeting of the Academy.

If Gramme's ring was an original conception independent from any knowledge of Pacinotti's labors or publications, or if Gramme borrowed the idea from Pacinotti is a question upon which experts disagree; some assert that he merely inverted the action of a Pacinotti electromotor, which had come to his shop for repairs. This is not improbable, as already in 1867 at the Paris Exhibition of that year Dr. W. Siemens pointed out the principle of the reversibility of the electro motor, and demonstrated it practically by the exhibition in the German section of a small hand dynamo, while in the English section Ladd had a large dynamo under the superscription: "New Principle of Conversion of Dynamic Force into Electric Currents."



THE CLARK DYNAMO—(SEE "THE GRAMME RING.")

These facts dispose of the assertion frequently published lately, that a prominent electrician should have expressed himself that he considered the reversion of the dynamo into a motor, as the most important discovery of the present day. The fact being that the dynamo, born scarcely 20 years ago, was a reversion of the electromotor, which was born 65 years ago, very soon after Sturgeon's invention of the electro magnet in 1828, about the same time that the electric telegraph was introduced.

That the Gramme ring has revolutionized the construction of the dynamo is proved by the fact that the greater number of them contain in themselves the fundamental principles of Pacinotti's ingenious invention, while at the same time this fact proves its superiority over other devices.

Many of our readers are undoubtedly aware that, for all this, the ring as wound by Gramme and Pacinotti has an inherent defect, which has increased since it has been extended in width, and as at present constructed is, correctly speaking, no more a ring but a drum open at both ends. This defect is that the return coils inside the drum are beyond the influence of the magnetic field, which is situated on the outside, and which wires are screened from the influence of that field by the iron of which the ring proper is composed, and without which iron the machine would be almost inert. Siemens has attempted to correct this defect by passing no wire whatever through the interior of the ring or drum, but carrying it across the axis, so as to have the wire coils entirely outside. The disadvantages of this device are great; it closes the ends of the drums and so prevents circulation of air, while the accumulation of a great mass of wire around the axis tends to an undesirable heating, which by protracted running of the machine and want of circulation becomes worse; from such heating a ring with open interior is more free, while after all the parts of the wires which cross the axis are useless, much more so than those inside the ring, which in the Gramme system are to a comparatively small extent benefited by the magnetism of the iron core of the ring induced by its passage through the magnetic field. This advantage is entirely lost in the Siemens system of winding.

There is, however a better method to correct the defect existing in the original Gramme system, namely, by introducing a second magnetic field inside the ring or drum. This was the idea of Mr. E. P. Clark, of Owego, New York, and it must be acknowledged that it leads to the conclusion that such an addition of an internal magnetic field must result in an increase of the current obtained. However, experience shows that practical results do not always correspond with what theories cause us to expect. It is a grave mistake to conclude from this that the theory is false or that theories in general are misleading; it only shows that some theories are incomplete and need correction (this, by the way, is said for the benefit of those who are prejudiced against theories). In the case under discussion, however, the practical result obtained by Mr. Clark proved at once the correctness of his views. As he is of an eminently practical turn of mind he soon set to work to make a trial; after constructing a small working model he built a dynamo requiring a one horse-power to run it and in which the Gramme ring revolved between exterior and interior field magnets. Its operation was so encouraging that he was induced to build a larger one requiring 10 horse-power. This has proved such an eminent success that it was at once placed on exhibition in the American Institute Fair, where it can now be seen in daily operation. It forms the main subject of the present article, and is represented in the adjoined engraving, which needs no other explanation than the men

tioning of the fact that while the field magnets at the left feed the exterior pole pieces, those at the right feed the interior ones, while both exterior and interior are as it were one, being cast in one piece, the upper part of the armature moving in a large deep semi-circular groove in the upper pole piece, while the lower part does the same in a similar groove in the lower pole piece.

As the interior magnetic field is necessarily confined to a smaller space than the exterior, and in consequence thereof would be weaker, Mr. Clark has resorted to the ingenious device of connecting the two inner poles by means of two extra electro magnets, which being so much interiorly situated that they cannot be seen and much less represented in a view of the machine; by this means he has succeeded in balancing the magnetic intensity of the exterior and interior fields.

Experts will easily realize the value of these improvements, when examining the results of the tests to which the machine was subjected, and of which an abstract is now submitted to their consideration.

In one of these tests the dynamo was run at a velocity 510 revolutions per minute, and the exterior resistance adjusted until the Ammeter indicated a current of 9 amperes, and the potential of electromotive force measured. The speed was then increased, resistance again adjusted to 6 amperes and potential measured, etc.; the results are contained in the following table:

Velocity of Revolution per Minute.	Current Strength.	Potential.
510	9 amperes.	450 volts.
570	9 "	500 "
1,026	9 "	900 "
1,140	9 "	1,000 "

It follows from this and other facts that the machine works to the greatest advantage when driven at a velocity of 950 to 1,000 revolutions per minute.

Next the machine was belted to the dynamo meter, and run at a velocity of 850 revolutions per minute. After running for some time a number of readings were taken from the dynamo meter, am-meter and volt meter. They were as follows:

Current (C)	9	amperes.
Potential at terminals	759	volts.
Power applied (W)	7,871	watts.
Friction of machine running idle (F)	307	"
Internal resistance of machine	6.1	ohms.
External resistance (r)	84.3	"
Total resistance (R)	90.4	"
External electric energy C^2r	6,828	watts.
Total electric energy C^2R	7,322.4	"
Efficiency of conversion, $\frac{C^2r}{W-F}$	96.81	per cent.
Commercial efficiency, $\frac{C^2r}{W}$	86.74	"

Experts will need no comment on the high performance of the Gramme ring when provided with the exterior and interior field magnet combined after Mr. Clark's method, and we will only add one peculiarity. When the machine is run by hand at a low velocity of only one or two revolutions per second, it becomes enough excited to show sparks at the commutator, and give a severe shock if imprudently handled. We are not aware that such a thing has been observed on any other dynamo of this size, and calculated to run with 10 horse-power at a velocity of 1,000 revolutions per minute, or 17 per second.

As a summary, it must be conceded that the machine is a great success, and that the inventor deserves the congratulations which already have been bestowed upon him by those who have witnessed and tested its performance.

TESTIMONIAL IN RELATION TO THE CLARKE DYNAMO, CONTROLLED BY MR. JAMES H. SEYMOUR, 159 CHAMBERS STREET, N. Y.

The subscriber can unhesitatingly testify as to exceptional efficiency of Mr. E. P. Clark's improved Gramme dynamo. The Gramme system is known to belong to the best, but it is at the same time acknowledged that it has the serious defect, that the part of the coils which are inside the ring armature do not come under the influence of the magnetic field, but only under that of the ring core. It was the fortunate idea of Mr. E. P. Clark of Owego, N. Y., to correct this defect, by constructing an additional magnetic field inside the ring, for the purpose of nearly doubling the efficiency. The way in which he has accomplished this has resulted in a machine of a most handsome and well proportioned design, which may now be seen in operation at the Industrial Exhibition of the American Institute.

In regard to the effectiveness I will only state that with a driving power of 10 horses it develops at 850 revolutions per minute a current of 9 amperes and an electromotive force of 759 volts. These numbers will suffice to give experts an idea of the excellence of its performance. For the benefit of others I will, however, state that while ordinarily one horse-power is required for each arc light, and therefore, 10 horse-power would light no more than 10 arc lamps, the machine is capable of lighting 17 arc lamps. Applying this to larger dynamos requiring say 100 horse-power to drive them, the advantange becomes more striking. A 100 horse-power dynamo, as now in use, will light 100 lamps, a 100 horse-power dynamo of the Clark type will light 170 lamps—a gain of 70 lamps over every hundred attained by the addition of the interior magnetic field.

I ought to add that the judicious distribution of the coils in this machine has resulted in the absence of heating effects produced by the generation of the Foucault currents.

I consider the Clark dynamo the best that has ever been invented and introduced for electric lighting.

P. H. VANDER WEYDE,
President of the New York Electrical Society, now the Electrical Section of the American Institute.
New York, October 4, 1886.

Phosphor-Bronze vs. Iron Wire.

At a recent meeting of the Société Belge des Electriciens, M. Bède, having enumerated the well-known advantages of phosphor-bronze for telegraphic and telephonic purposes, inquired why it was that the material had not been more widely employed in Belgium, especially in view of the fact of the introduction of the Van Rysselberghe system, for which a non-magnetic line was very desirable. In replying to these questions at a subsequent meeting, M. Banneux stated that the question of employing either bronze or copper wires for telegraphic purposes occupied the attention of the Belgian Government as long ago as the summer of 1883. In the course of this and the following year 440 kilometers of bronze and 150 kilometers of hard drawn copper were erected. The advantages of these wires when working with currents of brief duration, and the increased conductibility and high tensile strength, were fully recognized; but the question came to be one of cost. In the first place, the lifetime of an iron wire 4 mm. diameter is known to extend over an average period of at least twenty-five years; but the life-time of the non-magnetic wires is still an unknown quantity. While this is the case, it is impossible to arrive at any definite conclusion as to the relative cost of the two materials. At the same time the cost of a phosphor-bronze wire of 1.4 mm is 50 per cent. higher than that of an iron wire of 4 mm, which represents the same conductivity. A phosphor-bronze wire of the most recent manufacture will have a conductivity equal to 33 per cent. of that of pure copper, with a tenacity of about 48 tons per square inch. Whenever it becomes a question of erecting an entirely new line of posts, whether for telegraphic or for telephonic purposes, there can be no hesitation in adopting either bronze or copper wires, for then the additional cost of the lines is fully balanced by the diminution in the number of posts required, and the saving, not only of material, but in the cost of transport and of labor. In the meantime, taking into consideration the difference in the cost, the superiority of the bronze wire was not of so overwhelming a character as to justify the entire replacement of the iron wires at present in use. It may be added that hard drawn copper wire is now obtainable having a tensile strength of 19 tons to the square inch, and owing to the great depreciation in the value of this metal, its price compares favorably with iron wire of the same conductivity. The specific resistance is usually about 96 per cent. of that of pure copper.

Concerning German Inventions.

I have had occasion several times to refer to German inventions. With a good deal of red tape and expensive research I might give a very interesting account of what has been done. As it is I cannot hope even to make an approximation. This is one of the most striking features (says J. A. Butler, writing from Hanover to the Chicago *Times*) of the whole matter. Nothing, or at least very little, is popularized here. One inventor does not know what another has accomplished, and the people know still less, and it all accords with pronounced monarchical conditions. In a certain way they are all children. Everything is done for them, and powers of self-reliance and self-help in certain directions seem wanting altogether. The aristocratic stamp is upon everything. The demand for new and improved appliances doesn't come from the people, but the manufacturer first makes the instrument and then introduces it and persuades a demand if he can. If not, his improvement is forgotten and neglected. In this way much is known and used in one district which is unknown elsewhere, and much never gets beyond the knowledge of sedate and approving societies of learned men. For instance, a good telephone was invented years ago in Frankfort, and had been forgotten and neglected until American experiments awakened men's memories. Then it was claimed, I believe, that America must have stolen the invention. The government, however, is nothing if it is not practical, and welcomes and uses everything which its necessities require. The Carpenter brake is used on all the roads, and some lucky German inventor has induced the authorities to adapt a registering apparatus which would not be useless on roads in the United States. It is a very convenient and perfect contrivance for recording the movements and determining the location of trains at any moment. At the first glance it seems extremely intricate, but examination shows it to be one of the many simple devices which one wonders he has not contrived himself. It would be useless to describe it in detail, but the main features are interesting. At both ends of tunnels and at given distances along the track, say every quarter of a mile, a small wheel or button resting on a spring is placed at the side of the rail, projecting slightly above the upper surface, and yielding with an immediate rebound as the wheels pass over it. By doing this it connects a battery in a small metal structure close by with given stations. In the stations so-called electric clocks are fitted with external wheels, which keep paper tape in constant motion, which, of course, corresponds exactly with that of the clock itself. The tape is divided into numbered spaces representing hours, minutes, and, I believe, seconds, and a slender hammer with an aniline tip is connected with the clock and operated by electricity, making a short line on the tape at every pressure of the car wheels on the button described above. In this way if a train enters a tunnel at 10 o'clock the aniline-pointed hammer will record the pressure of the first wheel on the button at the figure 10 on the tape; the passage of each successive axle, and, therefore, the number of cars, is also recorded, and the length of time which ensues before the same thing is repeated at the next button indicates the speed the train is making. It will be seen that it is easy to equalize speed in this way, save wear and tear of engine and cars by injudicious or careless engineers, and reconcile the movements of different trains in such a way as to prevent collisions not only, but render prompt and immediate assistance in case of unavoidable disaster.

Another invention, which is said to give good promise of universal usefulness, is a material from which it is claimed very positively that absolutely fireproof buildings can be constructed. There have been so many attempts and failures in trying to secure this desirable result that it will naturally be looked upon with some suspicion, but in a public test which was made in Dusseldorf some time ago it seemed to more than answer the utmost requirements. The test was recorded in the German *Journal of Inventions* So far as I have been able to learn, the material consists of sand, gypsum, and a chemical fluid the nature of which is still a secret. Before use the material resembles a very fine gray mortar. The framework of the building being first erected, the studs and lathing are replaced by simple wire screens, tightly nailed above and below. The material is then put on with a trowel like ordinary mortar, on both sides, till the desired thickness is obtained, and left to dry. In the course of a day or so walls only two inches thick are said to become so hard and solid that heavy iron doors may be swung upon them and they would bear very severe blows from a heavy hammer. The test-house at Dusseldorf consisted of only four rooms, two above and two below. The upper and lower rooms on the right side of the building were separated by a floor of combustible material, and these with the left lower room were filled with shavings saturated with petroleum, and in this way, care being had to establish a good draft, the fire burned all about the upper left hand room, in which perishable articles had been placed, including oil-paintings on the inner wall. After the fire had burned fifteen minutes the external walls became slightly warm, about the warmth of the hand, and were moist. Presently an iron bar which extended through the wall became hot enough to ignite wood, but though the fire burned for half an hour longer no further change of temperature was observed on the outer surface of the building, and when the fire was extinguished everything in the test-chamber was found intact not only, but although the walls were thin the temperature was not raised to any noticeable extent. The experiment has not been repeated within my knowledge, and the question naturally arises whether the heat-enduring quality of the material was exhausted by the severe trial or not. My attention was called to it by a contractor who has seen it used extensively in private houses in Westphalia, and he spoke of it with unqualified approval. It would be worth while for interested peasons to make investigations into a matter which is apparently of inestimable value, particularly where houses are mainly built of wood. Another fact will be of interest to house owners and builders, and that is that by passing a strong current of air or steam—I have forgotten which—through the slag as it runs from blast furnaces it is readily blown into a white, feathery substance, which is extremely light, and makes a fireproof and very excellent "deadening" for floors. The discovery was the result of accident, and the material found immediate approval and is in use.

In concluding a brief reference to German discoveries and inventions it would be unfair to leave a field unmentioned which is peculiarly characteristic, and in which our Teutonic friends are perhaps unrivaled. It is easy to call to mind the genesis of it all in the old shops of the early centuries, when the professor of magic, with his establishment grimly decorated with hanging crocodiles, was not so respectable a personage as he is to-day. He tried very hard in those days to manufacture gold, and, though he has not yet succeeded, it is by no means certain that he is not trying in his more presentable form of modern chemist. Synthetic chemistry, however, though yielding no golden harvest, has produced wonderful results, and the German chemist is rather imprudently competing with the divine handiwork in creating useful materials from the original elements which have hitherto been only obtained from natural sources with pains and expense. The series begins with vinegar, which was made from its elements by Kohle, and during the last ten years Graebe and Liebermann have succeeded in producing alizarine artificially instead of extracting it from madder. Bayer has made indigo, Kohle salicylic acid, and constant efforts are being made, with a fair prospect of success, to manufacture artificial quinine.

*** The telephone and telegraph offices at Eastport, Me., were burned last week.

Pocket Accumulator.

An accumulator to light a lamp of 4 candle-power would not go in an ordinary sized pocket because you would require 4 cells, and if the plates are made too small the charge put into them would scarcely last a few seconds. The following is how I made my battery, which, when charged, lit a 4-volt lamp. Make a gutta percha vessel 3½ inches by 5 inches by 1 inch, and divide it into two cells by a strip 4¾ inches by ¾ inch. Now cut four plates, each 4½ inches by 1¼ inch, having an ear to each, from $\frac{1}{16}$ inch sheet lead; punch as many holes in each plate as you can to within ¾ inch from the ear or top end. Fill up the holes, and also well smear the plates with a thick paste of red led and sulphuric acid. Now cut out a piece from some hard wood, 3½ inches long, 1 inch wide, and ⅛ inch thick; pierce it with four slits large enough to allow the ears of the plates to come through (two to each cell) and also, where convenient, two holes should be made and fitted with glass tubes for the purpose of filling the cells. As soon as the red lead has become hard, place the four plates in their positions, and solder the ear of one plate to the ear piece of the next cell. This will leave one free end from each cell; to these a wire or terminal should be soldered. You can now cement on the top, and cover all over except the glass tubes with a composition of 1 of melted pitch and 2 of gutta percha. Having filled the cells three-quarters full with dilute sulphuric acid, connect the wires on a battery or small dynamo, charge, discharge, and reverse every three hours, and let the last charge remain in all night. Do this till you find your accumulator will ring a bell with fifteen minutes charging for about ten. Then only charge one way, and mark the ends in some way so as to know where to connect one next time for charging. This battery, when completed, will light a 3 or 4 volt lamp well during intervals for about two hours. My battery, which is exactly similar to the above, was formed by a 10-cell Daniell telegraph battery, and took a little more than a fortnight. Never charge your accumulator until within an hour or so of its being wanted for use, as it will run down a little by short-circuiting owing to the dampness of the inside. To show how long the charge will remain in such a small battery, I charged my accumulator last Monday evening and let it alone till Friday morning, when it contained sufficient energy to light a lamp for about 30 seconds. I forgot to say that before putting the plates in the cells for good, a piece of india rubber should be placed between the plates as well as a piece on the two outsides, and held by a piece of asbestos fiber, not india rubber rings, as they rot and fall to pieces in time. This prevents the plates from touching each other, as well as keeps them from shaking from side to side.—*English Mechanic.*

Well-Fitted Electrically.

The largest steam pressure craft in the world, the Alva, belonging to Mr. William K. Vanderbilt, was launched from the yards of the Harlan & Hollingsworth company last week. Work was begun on the vessel in early April, and at the request of the owner was pushed to completion within this last month. There will be electric lights throughout the ship, with speaking tubes, telegraphs and telephones leading to and from all points. These will be regulated by Sir William Thomson's magnetic compasses. For the fire engine pumps, electric dynamo, iron coolers, ice machine, special engines and machinery will be available. The deck boats and steam launches will be built of cedar, finished with teakwood and brass trimmings. The engine is of the compound surface condensing type, having three cylinders and three cranks. They are of the same type and style of marine engine as that of the fast Cunard line steamers Aurania and Etruria, and, like the latter, was designed in England, but built here. The diameter of the high-pressure cylinder is 32 inches, while that of the low-pressure registers 45 inches. The stroke of the piston is 3½ feet. The two large Scotch steel shell boilers have nearly 5,000 square feet of heating surface, and will supply steam at a working pressure of 100 pounds to the square inch. The propelling power will be found in a four-bladed screw-wheel, cast out of phosphor bronze metal, and having a diameter of 13½ feet. The vessel's speed will be about thirteen knots an hour. The vessel, when ready for sea—about December 1—will be commanded by Captain Henry Morrison, who for many years has acted so faithfully in the service of the American line between Philadelphia and Liverpool. The total cost of the vessel is $650,000.

An Electric Hat.

An ingenious application of the electric current to curative uses has been patented by George Litchenfeld, wigmaker of London. The apparatus consists of a very small battery—the largest size weighing only about three drachms—of the kind known to electricians as the chloride of silver terminals. It can be placed inside the lining of an ordinary silk hat, with the flat terminals outside the lining, so that when the hat is put on a current of electricity passes between the terminals and diffuses itself all over the wearer's head. The battery, though small, has considerable electro-motive force, the current being sufficient to ring a small bell or work a small induction coil. Mr. Litchenfeld claims for his apparatus that when applied to wigs or other head gear it proves a perfect cure for nervous headaches, neuralgia, etc. It is also claimed that the current of electricity will stimulate the growth of the hair and cure baldness. If the latter statement be true, the inventor must surely be a most disinterested wigmaker; for if baldness can be prevented, is not "Othello's occupation gone"?—*Pall Mall Gazette.*

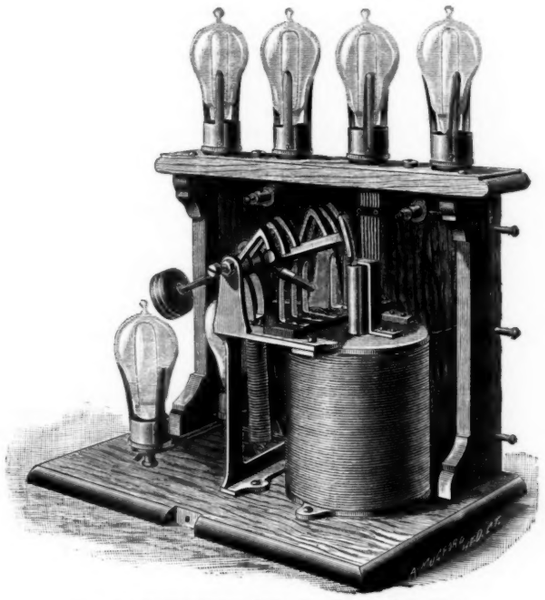


FIG. 2.—DISTRIBUTION BOX, WITH CASE REMOVED.

FIG. 1.—NEW MULTIPLE SERIES DISTRIBUTION BOX OF THE SCHUYLER ELECTRIC CO.

The Meter Out of Order.

Considerable consternation was caused Tuesday at a home wedding in the Eastern District of Brooklyn, by the lights going out in the midst of the ceremony. The bride and groom were Miss Lola Flandreau and Mr. Henry Hamilton Disosway. The wedding took place at the residence of the bride's parents, No. 272 South Fifth street. The Rev. J. H. Darlington, of Christ Church, was the officiating clergyman. As he was about to pronounce the couple man and wife the lights, of which there were many, suddenly went out. Candles had to be procured before the ceremony could be continued. It was supposed that some enemy of the family had tampered with the gas, but it was found on examination, that the meter was out of order.

* * A contract has been made by the Lehigh Valley Railroad with the Phelps Induction Telegraph Company, by which the last-named company will equip the entire system of the Lehigh Valley with the Phelps system of telegraphy, by which communication can be had with moving trains.

New Multiple Series Distribution Box.

Within the past few years the use of incandescent lights arranged in multiple series, or upon arc light circuit, has become quite an extended method of illumination. It was at first thought that the fact that the power absorbed by a group of lamps so supplied remained the same, whether one or all were burning, would be too great a disadvantage to warrant the use of this method, but in practice this objection has proved itself not so serious. In stores and places where incandescent lights are so used the possibility of turning the lights on or off individually is only a slight inconvenience.

It happens that often a certain area is required to be lighted for a given time, and for such places where the arc light would not be desirable the use of incandescent lamps in multiple series is especially adapted.

The Schuyler Company was among the first to foresee the practical application of the series multiple principle, and among other inventions for this purpose, the device shown in Figs. 1 and 2 was invented by Merle J. Wightman for regulating the current supplied to the separate groups of lamps. The invention is covered by strong patents, and is remarkable for its simplicity, and, hence, reliability, and embodies all the advantages for regulation and safety which are possible in such an apparatus.

It is arranged to check any excessive flow of current to the lamps, whether due to the breaking of a filament or to an increase of current from dynamo. It consists essentially of a solenoid, its core and a series of contacts. The helix is wound with a high resistance coil, and a coarse wire coil. The fine wire coil moves the coil and contacts connected with it, so as to cut in the required number of extra lamps to preserve a constant difference of potential between the terminals of that group.

The object of the main winding is to hold the core in the position to which it is brought by the shunt or high resistance coil. The Distributor is provided with a cutout for short circuiting the whole group should all the lamps be turned off.

An important feature of this Distributor is in the fact that it permits of a greater number of lamps being connected with it for supply than the current would ordinarily bring to incandescence, provided only the prescribed number of lamps is turned on at any time.

Several hundred of the Distributors are now in use, supplied from Schuyler and other stations and have given entire satisfaction.

Wind-Motor for Electric Lighting.

Such a wind-motor as you describe must be a clever thing, and if of any reasonable size and of sufficiently simple construction to avoid getting out of repair often, would, I should think, be a valuable invention, as there are many places in this country where the wind power, during 18 hours out of the 24, is strong enough to charge accumulators sufficiently to make them light lamps enough for any ordinary dwelling-house for the remaining six hours. Do not you forego a lot of possible power, however, if "the machinery driven by the motor runs at one uniform speed, however much the motor may vary in speed?" Do I understand you rightly that all increase in wind power after a certain point makes no difference to the speed of the dynamo, or do you utilize the wind increase for a separately-exciting dynamo while keeping the speed of the charging dynamo constant?—*English Mechanic.*

—— The electrical railway system is being introduced in a number of cities; among others the city of Detroit has recently started one by the Detroit Electrical Works of that city. This railway is pronounced very complete. They use the center rail and convey the current to the motors which are suspended between the wheels of the cars. The cars are made by the Pullman Palace Car Company, of that city. The station is equipped with a 100 horse-power boiler and a 10x12 Ball automatic engine of Erie, Pa. The company now run two cars over this road, and they estimate the coal consumption for the work will not exceed 1 000 pounds of coal for ten hours' work. The steam plant is especially adapted to this work.

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GEO. WORTHINGTON, - - - Editor.
CHARLES W. PRICE, Associate "
LOREN N. DOWNS, President.
ANDREW J. DAM, - Vice-Pres't and Treas.
C. C. HASKINS,)
GEO. A. HAMILTON, - Consulting Electricians.
GEO. H. BENJAMIN,)

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We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

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CONTENTS.

	PAGE
The Man who Helped Professor Morse Out of a Difficulty	1
Report of the Committee on Standards of Light.	1
A New Application of the Photophone	1
The Gramme Ring, its History and Recent Important Improvement	1
Phosphor-Bronze *vs.* Iron Wire	2
Concerning German Inventions.	2
Pocket Accumulator	3
Well-Fitted Electrically	3
The Meter Out of Order	3
An Electric Hat	3
New Multiple Series Distribution Box	3
Wind Motor for Electric Lighting	3
Editorial Notes	4
Lighting the Bartholdi Statue.	4
Large *vs.* Small Motors	4
Lighting Country Houses	4
Chicago Electrical News	4
Boston Electrical News	5
The Latest Story About A. Gower, the Telephone Inventor and Aeronaut	5
Welding by Electricity.	5
A Cement for Iron Pulleys	5
Static Induction of Brain Tissue—A Pointer.	5
Practical Information.	5
Telephonic News	6
Decision as to Discrimination in the Matter of Use of Telephones	6
Telephonic Induction	6
Tachometers	6
The United Telephone Company of the River Plate, Limited.	7
The Inventor of the Electric Telegraph	7
Inquiry as to Cats	7
Telegraphic	7
Electrical and Scientific	8
Two Interesting Electric Light Stations	8
A Telegraph Operator's Innocent Blunder	8
A Talk with a Plater.	8
Presentation to an Electric Light Manager	8
Digest of U. S. Patents on Storage Batteries	9
Underground Work in Detroit	9
Somerville Eager for the Electric Light	9
The Knights Were De[Electric]lighted	9
Electric Light News	9
Electrical Patents	10

There should not be any indications of shiftlessness in telephone offices or electric light stations. It is no more difficult to have these places neat and attractive than to have nothing in its place, and that place dirty.

The local boards of underwriters throughout the country have lately adopted a most stringent series of rules relative to the introduction of gas into buildings, a large number of fires occurring from introduction of natural gas or highly volatile water gas having rendered such precautions necessary. Thus it seems that there are other fluids besides electricity which are somewhat dangerous in their character. We are glad to see that our gas friends have awakened to the necessities of the occasion.

The presidents of the gas companies of the United States meet in convention at the Lafayette Hotel, Philadelphia, this week. We trust that none of them will blow out the gas on retiring.

Some recent experiments by a gentleman in the line of utilizing electricity for heating and cooking purposes, have greatly encouraged the inventor. This is working in a branch of electrical science in which there is an unlimited field of application.

"Short Lectures to Electrical Artisans," is the title of an admirable work just issued by E. and F. N. Spon. These lectures are by J. A. Fleming, and are interesting and practical—full of information for the electrical artisan and student.

There is no decrease in the number of electrical patents issued each week. Instead, there is a larger average list of these issued than at any time in the past. This indicates good business for the patent attorneys, as well as activity among the inventors.

This is the time of year when the wise one provides himself with instructive and entertaining reading matter for the winter. To the many thousand readers of the ELECTRICAL REVIEW this is not a hint; to every one not supplied with this journal, we hope it will come with sudden and convincing force.

There comes a report all the way from India that Frederick A. Gower, the telephone inventor and aeronaut, who was supposed to have been drowned from a balloon, is alive in Bombay, where he is enjoying life with many friends. His interests, which are nearly all in France, are said to be taken care of by his brother, George Gower. This is not at all a likely story, yet the friends of Mr. Gower in this country and Europe would be glad to learn that he is still alive.

An ordinance giving the American Telephone and Telegraph Company the right of way into the city of Philadelphia has been referred to a committee. It is likely that the ordinance will pass. The American Company has completed its lines from New York to the foot of Walnut street, Philadelphia, and will soon be ready for long distance work if the city grants the privileges mentioned, and which should in all fairness have been granted months ago.

At the recent Railroad Superintendents' Convention, held in this city, the president, Mr. W. H. Stevenson, superintendent of the New York, New Haven & Hartford Railway Company, gave an illustration of the Phelps system of telegraphing to and from moving trains, which attracted general interest. Mr. Stevenson stated that it had been in use on his road for six months, and he regarded it as invaluable, and urged its adoption by other railroads. This was a splendid endorsement of the intelligent work done by electrician Phelps.

Any one who cares to interest himself, cannot fail to be impressed with the growth of electrical thought and study. The alert mind, fond of discovery and invention, finds in electrical employment a congenial field, in which there is constant demand for efficient and original workers. In every State in the Union are to be found earnest students of the science, as well as capital ready and willing to assist. Of course, all are not "electricians," who claim that title—a bell hanger, or a battery room attendant may not deserve this title so often given him, yet many times in these cases will be found original ideas and skillful service, the result of study and experiment. An amusing instance is recalled in which an electrician—who was a compound of electrical knowledge and electrical bigotry—in a convention, first resented the title of "electrician," given him by a delegate, and an hour later, unthinkingly, stood up to explain an electrical problem, so that as he stated, ,, those present who were not electricians might understand !"

LIGHTING THE BARTHOLDI STATUE.

Some of the daily papers of this city feel called upon to criticise the action of Lieut. Millis in making a change in the lighting of the Bartholdi Statue. Lieut. Millis is a thoroughly capable electrician, and when the work is completed we are sure that his ideas will prove to be correct. The statue should be so lighted that it can be seen—not be left in the shadow—and this, we understand, is what Lieut. Millis is endeavoring to secure.

LARGE vs. SMALL MOTORS.

It is very generally supposed that the field for the transmission of power by small motors $\frac{1}{8}$ or $\frac{1}{4}$ horse power would be a very large one. Large numbers of these sizes are in use, and when their convenience and reliability become better known the number will increase. However, companies which have had experience in supplying power by electricity have found that the larger sizes 5, 7, 10 horse power are greatly in demand, and that considering the number of horse power of the large motors in use, the smaller sizes form a small minority.

LIGHTING COUNTRY HOUSES.

A writer to an English contemporary of ours, *Electrician*, says that the owners of country dwellings are learning that electrical lighting plants are not more expensive than gas plants. This discovery was made some little time ago here in America, and once made, a number of suburban dwellers showed an inclination to take advantage of it. Others are now following suit, and there seems reason for the belief that, before long, large country dwellings which are not lighted by night by electricity, will be an exception rather than the rule as now. Our contemporary enters into a discussion of the relative cost of isolated electrical and gas plants, and hence is restricted for the time to a consideration of electrical lighting where engine, boilers and dynamos are on the ground where the lighting is done. We would suggest, however, that there are several other means of obtaining electric light for country dwellings which may not be employed with gas. If the place to be lighted is in the neighborhood of a manufacturing town, sufficient electrical energy to light up a private house and grounds can be generated in the engine room or outbuildings of a factory or workshop.

As an instance of this, we heard recently that a gentleman living in the vicinity of Hartford, Conn., and whose name has escaped us, lighted up his house and grounds by energy generated at his mill, something like a mile distant. The mill, it seems, like many thereabouts, is not run at its full capacity, and hence there is more power on hand than is required. His house, a large one, had been lighted by oil, a gas works not being wanted because of its unpleasant odors and the dangers to which it is subject.

About two hundred lamps of the incandescence order are required, each of an intensity of sixteen candles, to light up the house itself, hot-house, green-house, conservatory and grounds, and these are now readily obtained without the immediate presence of an electric plant. The power that feeds the lamps is, therefore, invisible to the visitor, being brought by wire, as said before, from the factory at a distance.

It may, perhaps, be urged that, so far as the relative costs of electrical lighting and gas are concerned, the conditions remain unchanged even in this case, even if the first has advantages in point of convenience, because the same horse-power is required as if the engine and boilers were on the grounds. It will readily be seen, however, that this is not the case, because where power is generated in large quantities, as in the mill we have referred to, which probably has an engine of 600 or 700 horse-power, the cost is much reduced.

Perhaps a time will come when this mill will be run at its full capacity, and this will necessitate the putting in of a small individual engine. Even under these circumstances, there must be a considerable saving over a separate plant on the grounds, because of the presence at the mill of an engineer and his assistant, etc.

Now it can be shown that in this country, as in England, the cost of an isolated electric light plant is not much more expensive than a gas plant, when established on the spot where the lighting is needed. Hence, when the power for the electrical plant is furnished where there is a plethora of power, and where a large saving is made in attendance and in other ways, an electrical plant might naturally enough be expected to be no little cheaper than a gas plant of like capacity.

Two companies that we know of are making strenuous efforts to introduce these isolated electrical light plants in country dwellings, and have, we learn, met with no little success in their endeavors. It is not an easy matter to introduce a new system of lighting in a field where altogether different illuminants have been habitually used. A man may have intelligence sufficient to manage a large business, and yet not be sufficiently informed in electrical matters to know that there is less danger from electricity than from gas or oil, so far as fire is concerned, and that electrical apparatus does not, as some people believe, "explode." He has to be taught these truths in a mild, painstaking way—educated in electrical lighting from the ground up. It has, however, been discovered that when he once arrives at this happy educational condition he becomes a confirmed patron of electrical lighting, and will have no other.

CHICAGO ELECTRICAL NEWS.

St. Louis has some peculiar provisions in her electric light inspection regulations. The internal arrangement of wires is looked after by the insurance people. The outside wires are inspected by a city official, who sees that the wires are of at least number six B. & S., and that these are not less than twenty-five feet above the walk or street. At each pole four feet of rubber hose is required either side the insulator.

There are three central stations from which commercial lighting is done. The Brush, about two hundred and twenty-five lamps; the T. H. the same in round numbers; and the Guernsey-Scudder Co., one hundred and seventy-five Excelsior system—a total of about six hundred and seventy-five lights. Each company is compelled to execute a bond of indemnity of fifty thousand dollars to cover any losses which may arise from the wires or current, in case of accident to person or property.

The Wisconsin Telephone Company, has just made another change. The Secretary, Mr. Harry C. Haskins, who has but recently returned from Europe, has resigned that position, and Mr. Henry C. Payne, ex-postmaster of Milwaukee, has been elected to the vacancy so created.

Mr. Haskins has gone to New York, where it is probable he will remain for some time.

The Wisconsin Company came to the front with a quarterly two per cent. dividend on the 10th. It has come to be a dead sure thing when the quarter rolls round that the Wisconsin will pay a dividend of two dollars per share; and no one ever thinks of expecting a notice of dividend either. It comes, and that is all there is about it. This is number seventeen.

The Rocky Mountain Bell Telephone Company paid a quarterly dividend of one per cent. on the first of October.

The *Inter-Mountain*, published at Butte City, Montana, says the articles of incorporation of the Rocky Mountain Telegraph Company were filed to-day in the Recorder's office. The capital stock of the company is half a million, divided into five thousand shares of $100 each. Butte will be headquarters. Lines will be run to Medicine Hat, via Deer Lodge, Helena, Benton and Fort Assinaboine, and also to Grand Forks and Fargo, Dak., Cheyenne, Salt Lake, San Francisco,

Portland, and Victoria, B. C. This enterprise is a portion of the Mackey scheme.

The United Electrical Company, of Salt Lake, has just finished the wiring for the Denver & Rio Grande Western Railway Hotel, at Green River, Utah, for incandescent lights. Brush machines will be used. The same enterprising young firm has placed an annunciator in the same hotel, which is on the very border land of civilization, and Mormon civilization at that.

The signal service department reported a storm as entering the Gulf of Mexico on Saturday night, the 9th instant. It took things rather leisurely, and arrived at Galveston the second day, and gradually increased in severity, until its rate was forty-five miles an hour. Fortunately for the city, the high tide prevailing, supposed to be the tail end of a hurricane which was playing havoc in the West Indies, the wind was from the northward, and to some extent counteracted the damage of the incoming swell. Some fifty large steamships and vessels were pounding heavily on the wharves unable to get away.

The tracks of the Gulf, Colorado & Santa Fe Road were washed away, and the street car tracks on the gulf side were completely wrecked. During the day the barometer fell sixty points.

New Orleans had a taste of the storm, and towns on the Mississippi coast report gales on the sound.

The telegraph office at Fort Morgan, at the entrance of Mobile Bay, was flooded, and the operator reached dry land by swimming. And an old operator standing here remarked: "Another argument against female operators. If that had been a woman, I should have had to pay Joe Uhrig a dollar for the T. M. B. A., dont you see?"

By the morning of the 15th that storm, or some other, broke over Chicago with great violence.

The storm reached its culminating point about noon, when the wind rate was thirty-six miles an hour, and the barometer had fallen lower than ever before known here—29.089 inches.

Telegraph wires were all at sixes and sevens, and subsequent accounts show that Chicago was only one of many towns which suffered. The Western Union people here say it was the most general wreck of wires, etc., they had known for years. The comparatively dry weather helped materially in getting things going again.

CHICAGO, Oct. 18, 1886.

BOSTON ELECTRICAL NEWS.

Mr. Frank Ridlon, agent for the Brush-Swan Electric Light Company, owing to a need for more spacious quarters, necessitated by a rapidly increasing volume of business, has removed his office from No. 22 to No. 24 Rogers building, 209 Washington street, Boston.

The Sprague Electric Railway and Motor Company have started a passenger elevator for Zinn & Company, retail dry goods. The motor is 5 horse power, and the elevator running 90 feet per minute can carry 12 passengers. When the car descends a large portion of the current is returned to the line. To show the large number of uses for which these motors are being used I mention a few of the purposes for which motors have recently been put in: Bigelow & Rennard, jewelers, ¾ horse power for buffing; Lewis Newston, 146 Oliver street, 1½ horse power, sewing machines; Kaufman Bros., 157 Kingston street, ¾ horse power, sewing machines; Day, Kallaban & Co., 30 Summer street, 1½ horse power, sewing machines; James S. Stone, 2 heavy freight elevators. Printing presses, buffing wheels, ventilating fans, lathes, and almost any variety of machinery can be seen in operation, the motive power being automatic Sprague motors.

BOSTON, MASS., Oct. 19.

How would an electric elevated railroad on Broadway strike the citizens of New York? Such a scheme is said to be receiving the attention of a number of capitalists. It might be well, also, to have a few capable electricians connected with the work.

The Latest Story About A. Gower, the Telephone Inventor and Aeronaut.

As strange and startling as was the story of the disappearance of Frederick A. Gower, the telephone inventor and aeronaut, is the information of his reappearance alive and well in Bombay, India. Gower, who was a newsboy, and subsequently editor of the *Press* in this city, left his newspaper desk when the first public exhibition was given here of the telephone. He contracted with Prof. Bell to deliver lectures throughout the country, and afterwards took the French capital as his field for introducing the telephone into popular use. Soon after reaching Paris he amassed a fortune. His telephone enterprise thrived, and he soon became the patentee of several of the most important improvements that have helped to make the telephone so valuable an instrument.

Having satisfied his thirst for discovery and invention in this direction, Gower set to work experimenting with machinery for aerial navigation. His ideas were found good in many respects, but they did not differ materially from many others that had been tried in the Franco-Prussian war. Finally, after many ascensions in different parts of France, with all of which he claimed to be perfectly satisfied, he made extensive preparations for ascending in a monster balloon from Dieppe. All of his appliances for aerial navigation were adjusted. The ascension took place. The machinery apparently refused to work as Gower had claimed it would. The wind was out to sea that day, and Gower had persistently argued that he could face the wind and that his air ship could go to windward as well as to leeward. French scientists jeered at this claim, the balloon went out to sea and the only vestige of the big air castle that was ever found was the basket, which was picked up on the coast many miles away. Gower was given up as lost. He had, not very long before, married Mlle. Nordica, the prima donna, who, however, did not live happily with her rich American husband.

Now comes the story that on Malibar Hill, in Bombay, the vanished American is living in good health, while his brother, George Lewis Gower, is in France taking care of his interests. Gower, it is said, is a great friend of a handsome Indian princess, and is the lion of a very lively European society circle.

PROVIDENCE, R. I., Oct. 16.

Welding by Electricity.

In your issue of the 17th inst., writes J. B. Duncan to the London *Electrical Review*, I read with much interest an article on welding by electricity, in which is described a method as carried out by Professor Elihu Thompson, of Boston.

I desire, with your permission, to draw attention to the fact that I applied, fully 18 months ago, the well-known principle that there is greater electrical resistance at a break than at any other portion of a conductor, and consequently increased temperature at this point, to effect the welding or fusing of wires together. Since then I have repeatedly (as well as our workmen) fused or welded wires together for incandescent lamps. The practical application of this well-known fact, and one which commends itself to manufacturers and users of incandescent lamps, consisted on my part of welding the ends of broken platinum loops of incandescent lamps, by this means rendering otherwise useless lamps valuable. The apparatus I employ for performing this operation is more primitive than that of Professor Thompson, but the principle is the same. It consists in fastening to the whole loop of the lamp a flexible terminal of dynamo (either alternate or direct) of sufficient electromotive force to render the (filament ?) incandescent. I then bring the ends of the defective loop in contact with each other, at this contact complete the circuit through the filament by touching the other terminal of the dynamo, I then break circuit at this contract and a welded or fused junction is effected.

The heat necessary to fuse the platinum is so completely localized to the joint that no damage is done to the glass of the lamp. The welding is more easily done with low than with high resistance filaments for the same size of wire, as is evident.

A Cement for Iron Pulleys.

Editors Electrical Review:

I have noticed in your columns some valuable receipts under the head of Practical Information.

I enclose you a receipt for a cement for covering iron pulleys with paper, which may be of value to many of your readers, as it will do away with the annoyance and trouble of slipping belts. I covered a 36 inch pulley 14 inch face with this receipt six years ago, and it is running to-day as good as the day it was put on.

Take 10 pounds of wheat flour and mix well with cold water until stiff; have kettle of boiling water ready, put paste on the fire and pour on hot water. Keep stirring so it does not stick to bottom of kettle; let it cook until it becomes stiff again, then take it off the fire and while hot add 10 cents worth of muriatic acid, 10 cents worth of carbolic acid and one tablespoonful of powdered alum (dissolve alum in a little water); mix all thoroughly and let cool. Use No. 100 straw board cut in strips to suit face of pulley, dampen one side of paper a little with a sponge, apply paste to opposite side or dry side, then lay it evenly on pulley and scrape all surplus paste out by rubbing. Be careful to break joints. Two or three layers are sufficient. Clean the face of pulley of all grease, with concentated lye. (Keep in a cool place and it will keep sweet for a year.)

Respectfully yours,

GEO. S. NICKUM.

Dayton, Ohio, Oct. 11, 1886.

Static Induction of Brain Tissue—A Pointer.

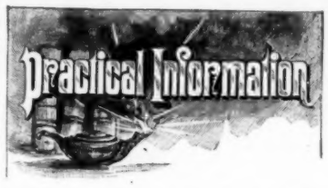
A hitherto unpublished paper of Bourseul [=in English "for No. 1 every time"], often spelled with the sonant instead of the surd.

Bourseul was an officer in the French army, and among his numerous bundles of correspondence from the fair sex, tied up in red ribbon and labeled "Ahdeume's flirtation, to be opened after death," there were found a number of papers on scientific subjects. Now, as some persons had denied to him the full honor of making one of the most valuable inventions of the age, we, his heirs and assigns, do hereby publish the following, that no question may be raised as to priority, etc:

In considering the processes of the human mind, it occurred to me that by the vibrations of organized elastic cellular tissue we think. If it be possible to transmit these vibrations or reproduce them at a distance upon the brain of some second person, the problem of thought transference would be accomplished. It has occurred to me that the wonderful communications from spirits through the person of the medium are accomplished by the variations in the static charge of the brain tissue. The value of the invention I describe would be beyond conception. By its use we could receive the thoughts of our friends and know just when they wanted us to accept their invitation to dinner, and when we had better end our call; the insincerity of the repentant bad boy would not save him from a flogging; and Matilda could not deceive her pa when he asked her if Josephus kissed her over the garden gate the night before; the work of councils examining a candidate for a pulpit would be lessened. In fact, a new era would dawn upon the world.

F. M. G.

It is often deemed sufficient to smooth off edges of dynamo brushes with a file. This is not the case. Any roughness in the brush tends to wear the commutator unevenly. Grinding and polishing on band wheels gives an excellent bearing surface for brushes. While on the subject we might say a word on the case of commutators. Emery in any shape should not be used in smoothing the surface, for small particles will imbed themselves in the insulation between the segments of the commutator, and the brush will be made rough, and a rough brush wears the commutator. The finest files alone should be used. There is great danger in using a coarse file of short circuiting one or more sections of the armature, and thereby sections are likely to burn out.



TO DISSOLVE SILVER AND GOLD.—Silver may be dissolved in nitric acid, and again reduced to a metallic state by adding copper, after removing excess of moisture by evaporation. Gold can be dissolved in warm nitro-muriatic acid, and it may be recovered or reduced to a metallic state by precipitating with copperas and then melting the precipitate in a crucible.

Enough is as good as a feast. Many a bearing in accurately aligned shafting has been known to heat even when supplied with abundance of oil. The trouble often arises from the oil hole filling up so that the air cannot escape. All oil now added runs off the outside of the bearing. If a very small amount be fed, say, 1 drop in 3 minutes, the oil hole will be never filled and the air can escape as the oil enters the bearings.

Prof. Hughes has shown that a stranded iron wire cable has less self-induction than one of the same mass of metal formed into a solid wire. The explanation of this is that the circular field of magnetic force around the axis, which exists inside the wire as well as outside, is not as strong in the interior of the stranded iron cable as in the interior of the solid iron rod. The stranding reduces the magnetic permeability along lines which are circles described around the axis, and hence reduces the self-induction.

The form which an electro-magnet should have depends upon the nature of the operations it is used to perform. A design of an electro-magnet, which is very suitable for some purposes, is not suited at all for others. Supposing it is desired to make an electro-magnet which shall be capable of rapid changes of strength, or possess small residual magnetism, it should be made of very soft Norway or Swedish iron, and have the form of a short, stout bar, rather than a long, thin one. The reason for this is that the ends or poles of a magnet exert a depolarizing action upon the mass of the interior of the magnet.

The gramme is the standard of mass; 453.59 grammes are equal in weight to one pound avoirdupois. Centimeter is the standard of length; 2.5 centimeters make one inch, nearly. A unit of force is a force which can impart a velocity of one centimeter per second to a mass of one gramme after acting upon it for one second. This unit of force is called one dyne. A force of one million dynes is called a megadyne, and the weight of 2¼ pounds, say at London, is about a megadyne. If two poles placed one centimeter apart attract each other with a force of one dyne, they are said to be unit poles. The square root of the number, which expresses the attraction in dynes between two equal magnetic poles placed one centimeter apart, is a measure of the strength of each pole.

It is often necessary to be able to measure the magnetic field in an air gap in between the poles of an electro-magnet. The best way to do this is to take a length of covered wire and make a loop at the middle, or to take a small flat coil of wire and twist together the leading wires. This coil or loop should be placed in the magnetic field to be measured, and the ends of the leading wires attached to a galvanometer having a very freely-suspended needle. The loop is to be held so that its plane is perpendicular to the lines of force of the field. On snatching away suddenly the coil or loop, all the lines of force which passed through it are cut through or removed from it, and the removal of these lines creates an induction current in the loop, which evidences itself by making a sudden swing of the galvanometer. If a reflecting galvanometer is used, and if the swing of the needle does not extend more than a few degrees of arc, the strength of the field is proportional to the extent of amplitude of the swing. In order to obtain absolute measurement, the same experiment must be performed by placing the coil or loop in a magnetic field of known strength. This can be done by holding it in the interior of a helix of wire traversed by a known current.

Telephonic News

*** "Is that you, doctor?" "Yes; who is it?" "Mrs. Merony: Oh, doctor, what shall I do for baby? He has swallowed a dime." "Well, you surely don't want to spend $2 to get a dime, do you?" and the telephone ceased to work.

*** Eighteen different telephone girls employed in the Hartford office have been married during the last three years to some of the subscribers on the line. It would seem to be a woman's voice more than her looks which catches on.

*** The *Morning News*, of Savannah, Ga., knows a good thing. It has in daily use three telephones—one for the business department, one for the editorial rooms, and one for the job department. And we venture the guess that each telephone pays for itself twice over during the year.

*** The telephone exchange in Kansas City, Mo., is increasing at the rate of 50 subscribers a month, 1,700 now renting telephones of the company in that city. Mr. D. B. Macquarrie, manager of the exchange, is now in the East, where he has a number of electrical friends. He is a gentleman of extended experience in telegraph and telephone construction work.

*** The heavy wind storm in various parts of the United States last week did considerable damage to telephone lines in Chicago, Detroit, Buffalo, New Orleans and other cities. In New Orleans, five of the large poles of the Great Southern Telephone Company were broken off at the base, and the wires became badly tangled. In the same city, the electric light, telegraph and district wires all suffered from the storm.

*** Commissioner Flower, of the Subway Board, states that a contract has been made with the Metropolitan Telephone Company to carry its wires at a yearly rental of $5 a mile. The cost of maintaining the Western Union wires in this city is estimated at about $20 a mile. Mr. Flower was of opinion that the Western Union Company would soon see the practical economy of using the underground conduits and cease its opposition to the Commission.

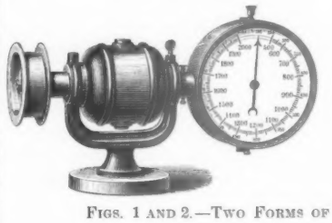
*** Lynn, Mass., is to have an underground system as soon as the authorities grant the necessary permit. The proposed route selected for laying the wires of the Woodward Underground Telephone and Telegraph Lines is through Munroe, Market, Franklin and Boston streets to Peabody line, there connecting with the Salem branch line. The Boston connection will intersect at Franklin street, running through Western avenue to Saugus line.

*** The Citizens' Co-operative Telephone Company, of Indianapolis, is according to one of the officers, awaiting for the old company (Central Union) to pull up stakes and move From present indications the wait will be a long one, as the Central seems to be settled for the winter and consequently for all time, since the legislature will probably undo the ineffectual law by which it was proposed to regulate the use and price of telephones. The co-operative company protests that it will begin the erection of poles and lines within twenty four hours after the Bell Company is served with notice to quit. The old Board of Trade room has been leased for a telephone exchange by the Wallace people, and several private lines, it is said, will be put up at once. This company claims that the Central is receiving from some patrons as high as $15 and $20 per month for telephone service, while $3 is the highest legal rate.

*** There is considerable new telephone work being projected in the South at the present time. A new line between Titusville and Rockledge, Fla., is being constructed.

Decision as to Discrimination in the Matter of Use of Telephones.

The Pennsylvania Corporation act of 1874 provides, among other things, that telegraph companies shall "receive dispatches from and for other telegraph lines and corporations and from and for any individual, and on payment of their usual charges to individuals for transmitting dispatches as established by the rates and regulations of such telegraph line, transmit the same with impartiality and good faith." The Bell Telephone Company of Philadelphia, a company chartered under the act of 1874, refused an application from the Baltimore and Ohio Telegraph Company to supply a telephone instrument and the necessary connecting wises at its office in Philadelphia, though the latter company offered to pay the usual rental therefor and to comply with all the reasonable rules and regulations of the former company. The telephone company set up, among other things, that it was subject in its dealings with the people of Philadelphia, to an agreement between the National Bell Telephone Company and the Western Union Telegraph Company, to the effect that telephones controlled by the former company were not to be used for the transmission of general business messages, market quotations or news for sale or publication in competition with the Western Union Telegraph Company or with that of the Gold and Stock Telegraph Company. The Philadelphia Common Pleas Court granted a writ of peremptory mandamus compelling the Bell Telephone Company to furnish to the Baltimore and Ohio Telegraph Company the facilities demanded. This action was sustained by the Supreme Court of Pennsylvania (Bell Telephone Company of Philadelphia *vs.* Commonwealth *ex rel.* Baltimore and Ohio Telegraph Company). The Court of Common Pleas, whose opinion was adopted by the Supreme Court as a correct statement of the law, said: The respondent cannot shield itself from the performance of its duty to serve the public impartially and without discrimination, by a contract with a party not within the State. We deal with parties carrying on a public business within our borders, under the protection of our laws, to compel them to comply with our laws. They cannot obtain immunity from their obligation to treat all alike by pleading a license from parties beyond our grasp. The owner of a patent may put it in public use or withhold it as he chooses; but if he does put it in public use, then, as was well said by Chief Justice McIlvaine, of Ohio, "The manner of its use may be controlled and regulated by state laws when the public welfare requires it. The patent gives him a monopoly by protecting him from the competition of other persons in the business secured by the patent, but it does not permit him to make discriminations against persons who are willing to pay the same rates which other persons are charged for the use of it."



FIGS. 1 AND 2.—TWO FORMS OF TACHOMETERS.

Telephonic Induction.

Mr. Preece's paper on "Induction Between Wire and Wire," lately read before the British Association, revealed a somewhat alarming extent of electrical induction. In Gray's Inn Road a telegraph wire suffered induction from a telegraph cable 80 feet below in the ground. The complaints induced Mr. Preece to arrange experiments on a larger scale. In Newcastle induction was noticeable at 3,000 feet distance. Experiments on the Durham-Darlington lines, and two other parallel lines—the one 10¼ miles east, the other 5¼ miles west—proved that on a Sunday when all other traffic was stopped, a peculiar signal given on the central wires of 18 miles length could distinctly be heard at the four corners of the two other parallel wires, and, moreover, Morse signals were heard which could only come from a line 40 miles away. Two other lines were therefore selected—one from Newcastle 55 mile long, with 10 wires; the other from Gretna, 40 miles long, with 17 wires, the two being about parallel and 40 miles distant from one another. The wail produced by intermittent increasing and decreasing currents by means of a special commutator in the one line was sadly audible in the other. Mr. Preece did not consider these tests conclusive evidence of induction, because earth was used as return lead, although the respective line terminals were most carefully insulated. Another series of experiments is, therefore, now being carried on, with gutta percha wires bent so as to form squares, of a side of ¼-mile length. Two such squares have been placed on the ground ¼ mile apart; and what is intrusted to a telephone inserted in the one closed circuit can be listened to in the other. If facts of this kind become known, the telephone will not gain in favor. Cables are not much better, perhaps; signals given in the one cable to the Scilly Islands have been heard in the other cable half a mile away. It is further intended to carry a special double line of copper wire to Wales. Professor Silvanus Thompson objected to the term induction, which has become the household explanation for a good many different troubles. As the earth was used in Mr Preece's tests, and perfect insulation is a practical impossibility, the lines of force tapped at any two points must necessarily indicate current variations. Mr. Preece protested against having characterized the phenomena as induction phenomena. It was remarked that at the electrical tramway line at Giant's Causeway a telegraph wire is only 28 feet from the conductor rail, and no induction effects have ever been complained of, although the postal authorities had to be satisfied about a great many points before agreeing to have the two lines so near one another. A test experiment was further suggested. Let us take three parallel wires, the one for the signals, the other two on the same side of the first for listening with the telephone at the one terminal; if we have to deal with conduction, it cannot make any difference whether or not we join the two other wires by auxiliary wires, so that they form one complete telephone circuit; if it is induction, a difference must result.

Mr. Preece further related how he had found a piece of a needle, suspected of being in his daughter's hand, when Professor Hughes' induction balance and Bell's contrivance, with which he localized the bullet in President Garfield's body, had failed. Mr. Preece strongly magnetized a steel needle of the same size as the one which had broken in his daughter's hand. Suspending this by a paper stirrup, he observed a deflection when the needle was near the hand, and succeeded in localizing the steel piece in the palm, so that an operation could be performed a fortnight after the accident, yielding a piece of the refractory needle ¼ inch long.

—— It is now claimed that an incandescent lamp which requires no vacuum in the globe has been invented in Germany. The wire used is a mixture of conducting and non-conducting elements, the latter preventing the former from melting.

Tachometers.

The views of tachometers presented in this issue will interest all our readers whose business compels the use of speed indicators. Figs. 1 and 2 are both actuated by pulleys or toothed gear, and are designed to enable the number of revolutions performed per minute by shafting to be accurately and continually indicated by a pointer traveling over a suitably graduated scale or dial. The action of the apparatus will be understood from the following description: In the intermediate cyclindrical case rotate two suspended weights or pendulums of peculiar form, which are connected together by a strong flat spring coiled in a spiral. The function of this spring is to counterbalance the centrifugal force of the pendulums. The deviations of these pendulums are communicated by a rod to specially-constructed clockwork in the case behind the dial, and are represented by corresponding deflections of the pointer. When connected to shafting subject to unsteadiness, vibration or sudden shocks, the apparatus works with unimpaired regularity and precision, being so strongly constructed as to be unable to get out of order with fair usage. In Fig. 1 the dial case is capable of turning on a horizontal axis, and in Fig. 2 on a vertical axis. This enables the dial to be presented in any direction as required. The portable apparatus is shown in Fig. 3. This small and handy instrument enables the rate of speed of shafting, making from 50 to 2,000 revolutions per minute, to be readily and accurately ascertained without a watch or any supplementary appliance.

This instrument is used in the same manner as ordinary counters, being connected to the shaft whose speed is to be indicated by means of a three edged point that is put over the driving spindle of the tachometer, and caused to engage with the end of the shaft. The tachometer spindle is thus caused to rotate with the shaft, and the requisite motion is thereby transmitted to the indicating mechanism.

The engraving represents the tachometer, placed in a neat case provided with a suitable handle, and drawn to a scale of one-third of the actual size. These tachometers are from the well-known house of James W. Queen & Co., of Philadelphia, who control them in this country. Queen & Co. are the sole agents of Hartmann & Braun, and the representatives of Buss, Sombart & Co.

In this connection we illustrate the tachograph (Figs. 4 and 5), controlled in America by the same company. These are self-registering speed indicators for stationary and portable engines. This apparatus indicates the number of revolutions actually being performed per minute by revolving shafts, and also registers or records the rates of speed at the same time upon a strip of paper, thereby enabling not only the present but also the past rates of speed of an engine or machine to be accurately ascertained at all times. This is especially important for engines working by night, and which are required to run at a uniform rate, as well as in all cases where it is of importance that the maximum rate of speed consistent with safety shall not be exceeded.

The tachograph is capable of rendering excellent service in connection with winding engines for mines and the like, as it records the variations in the speed during each winding in the form of a diagram upon a strip of paper that is advanced at the rate of about three-quarters of an inch per minute.

For ordinary applications the apparatus is adjusted to advance the strip of paper at the rate of about three-sixteenths of an inch per minute—a speed that is usually found sufficient.

The maximum speed recorded by the tachograph may be from four to four and a half times as great as the minimum speed; thus, for example, the speeds recorded may vary between 250 and 1,000, 50 and 200, 25 and 100 or 12½ and 50 revolutions per minute, according to the relative adjustment of the apparatus.

The distance between the highest and lowest points in the curve is about one and a half inches, thus affording sufficient space

for clearly distinguishing the variations in the speed.

The unwinding of the paper ribbon may be stopped instantaneously by a simple clutch arrangement without interfering with the action of the timekeeper and other mechanism. A considerable saving in the quantity of paper employed is thus effected, it being frequently sufficient to make a record of the speed at intervals only, the present rate being ascertainable at all times by an inspection of the dial.

The United Telephone Company of the River Plate, Limited.

The directors of this company submit the following statment of accounts and balance sheet for the year ending March 31st, 1886—Mr. Frank W. Jones being chairman and managing director:

The capital expenditure in extending the exchange and private wire system during the year was £11,629 14s. 3d., making a total expenditure on account of plant of £92,764 13s. 6d.

The revenue of the company for the year was £25,212 4s 2d.

The working expenses in the River Plate were £12,439 14s. 11d.

The number of subscribers, March 31st, 1886, was 1,522, as compared with 1,364 at the same date last year.

The plant generally is in better and more effective order than ever before. The use of cable in the place of a number of single wires has been introduced, and hard-drawn copper wire has been adopted for the longer lines. These and other improvements are effecting great economy in maintenance and much better service.

The profits on sales were less than for the preceding year, but the receipts from subscribers increased during the year 40 per cent. This increase was mainly attributable to the rise of rates from the 1st of July, which was made practicable by the improved service and the additional facilities afforded subscribers.

The River Plate expenses exceeded those of the year before by £1,072 6s. 5d., being about 10 per cent.; but, as the increase of subscribers during the year was something more than 10 per cent., the same relative expenditure was maintained. Considering the great depreciation of Argentine currency during this period, the ability to retain the previous rate of expenditure entitles our River Plate director, Mr. Adolph Fels, to especial commendation. Although the year was a very trying one financially in all the River Plate, the business of the company constantly improved.

The advance from July 31st, 1885, to July 31st, 1886, was exceptional and very gratifying. It is shown as follows:

	July 31st, 1885.	July 31st, 1886.	Increase.
Subscribers.	1,391	1,658	267
Annual value of paying subscribers.	£21,500	£29,278	£7,778

The rate of exchange, as in preceding reports, is calculated at par. The absolute value of the receipts during the year was greatly lessened by the depreciation in Argentine currency. The difference, £3,230 1s., between the depreciated value of the balance of revenue and par, has been carried to reserve. The currency is now rapidly improving, and the outlook for the present year is in every respect assuring.

The amount written off for depreciation of plant for the year ending March 31st, 1884, was £3,500 15s. 4d.; for the succeeding year it was £3,881 14s. 2d; and for last year the amount written off is £4,000. For the convenience of showing all these sums under the same heading, they have been carried in the balance sheet to reserve for depreciation of plant, instead of only bringing out the net value of the plant, as was done for the year ending March 31st, 1885.

* * The Phospor-Bronze Smelting Company, limited, 512 Arch street, Philadelphia, announces that, in consequence of the advance in the price of ingot copper, it has withdrawn all quotations made prior to September 30 for phosphor-bronze, ingot metal castings and manufactured goods. It will be pleased to quote prices at any time on receipt of detailed specification of quantity, quality, etc.

Underground Wires Recommended.

The annual report of Superintendent H. R. Miles, of the District Telegraph and Telephone Service, Washington, D. C., submitted to the Commissioners last week, very strongly recommends that the air-line system be abandoned. The cost of placing all the District wires under ground is estimated at $150,000, which is based upon laying trunk lines with loop or branch routes, which would require 500 miles of wire. Mr. Miles submits a schedule of streets on which he recommends the wires be put under ground, and asks that an appropriation of $25,000 be secured next fiscal year for beginning the work. He also asks for not less than ten new signal boxes for the extension of the Fire Alarm Service to the suburban districts.

The Inventor of the Electric Telegraph.

In a glass frame, hung upon the walls of the library in the Watt Institute at Greenock, Mr. Allan Park Paton, the librarian, has placed the scraps that have been written about that mysterious native of James Watt's town, who, under the signature of "C. M," gave an account in the *Scots Magazine*, in 1753, of an electric telegraph which he had invented. Not much has been ascertained concerning the man, but that little places it beyond a doubt that his name was Charles Morrison, that he was bred a surgeon, was for some time connected with the tobacco trade in Glasgow, devoted himself at Renfrew to scientific experiments, which led the enlightened people of that ancient burgh to the conclusion that he was crazy and had dealings with the devil, and that finally he emigrated to Virginia, in the United States, where he afterwards died. A writer in the *Celtic Magazine* for September, who reprints the handful of somewhat hazy documents about Morrison that have been hung up in the Greenock Library, states that Mr. Paton, the librarian, "has set himself with characteristic zeal to rescue Morrison's name from the waters of oblivion that seem well-nigh to have overcome it." It was Sir David Brewster who, in 1859, disinterred the letter of "C. M." from the old volume of the *Scots Magazine*, adding the remark, "Here we have an electric telegraph upwards of a hundred years old, which at the present day would convey intelligence expeditiously, and we are constrained to admit that 'C. M.' was the inventor of the electric telegraph. Everything done since is only an improvement." In this article of Brewster's, which appeared in the *North British Review*, and a passing allusion by Professor Tyndall, is summed up all the honor that has thus far been paid to the memory of Morrison. The good folks of Greenock should lose no opportunity of collecting all the memorials of this inventor, and it is to be hoped that if any one has a contribution to make to the story of his life, either from oral tradition or from as yet unpublished documentary sources, no delay will take place in adding it to the information that has been already garnered. It is no small feather in the cap of Greenock that, besides being the birthplace of the illustrious inventor of the steam engine, she can also claim for one of her sons the man who was the first to discover the principle of the electric telegraph, and to construct an instrument by which messages were conveyed from place to place.—*Glasgow Mail.*

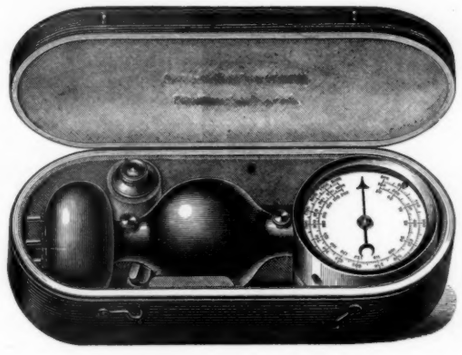


FIG. 3.—PORTABLE TACHOMETER

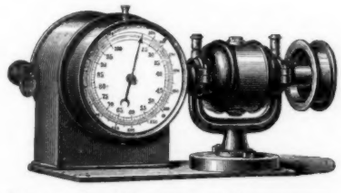


FIG. 4.—SELF REGISTERING TACHOMETER.

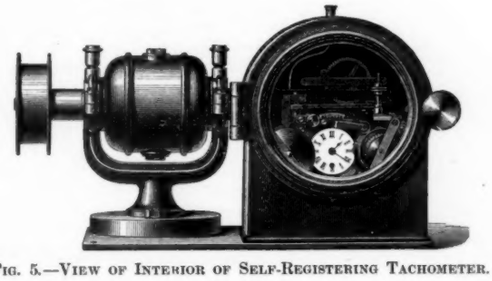


FIG. 5.—VIEW OF INTERIOR OF SELF-REGISTERING TACHOMETER.

Inquiry as to Cats.

At one of the down town police stations in Boston, is a patrolman who is noted for his penuriousness, and the boys are perpetually endeavoring to devise some scheme to cause him to spend money. Early last evening a district telegraph boy waltzed into the station with a dispatch for the above mentioned officer, on which there was 38 cents to pay. With a sigh of deep regret the officer thrust his hand into his pocket, and after a long parting look of sadness, relinquished his grasp on the coin. The dispatch read:

"Mr.——: How are the cats on your beat?"

The scene that followed is beyond the power of description.

TELEGRAPHIC

.... The Northwestern District Telegraph Company, of Portland, Oregon, has been organized by Messrs. Henry Everding, A. A. Honey, and A. G. Cunningham. The capital stock is $50,000.

.... The Pacific Mutual Telegraph Company will soon build to Topeka from Kansas City, a distance of 70 miles. The company has applied to Judge Guthrie through their attorneys, Messrs. Rossington, Smith & Dallas, for the appointment of a commission to condemn land in Shawnee County, Kansas, for the erection of poles, etc. Judge Guthrie appointed J. B. Larimer, John H. Calvin, and Albert Thompson, as such commission.

.... The annual meeting of the stockholders of the American District Telegraph Company, of Baltimore, was held in the Chamber of Commerce Building yesterday, when the following board of directors was chosen: Decatur H. Miller, S. H. Adams, Charles D. Fisher, Robert Garrett, James Sloan, Jr., Judge Wm. A. Fisher, R. J. Bloxham, Charles A. Tinker, F. C. Latrobe, John King, Jr., Wm. F. Frick and Edward Higgins The directors will meet next month, when officers will be chosen.

.... Thomas Jacobs heard footsteps on the roof of his house in Hudson street, Hoboken, at 3 o'clock in the afternoon. He found a young man in the act of disconnecting a telegraph wire which ran into a pool room in an adjoining building. The man was arrested. He said he was Caleb Moncrief, of 907 Gates avenue, Brooklyn. He is an operator in the main office in this city, of the Baltimore and Ohio Telegraph Company. He admitted that he intended to tap the wire to get the results of the Latonia and Brighton Beach races before they reached the pool room, and said that he had been employed to do so by some betting men, whose names he did not know He was held for examination.

.... The Baltimore and Ohio Telegraph Company has advanced both local and country rates. The rate to New Orleans has been advanced ten cents and on the city the rate has been made fifteen cents for ten words instead of ten cents. This is the Western Union tariff. It was said recently by a man whose knowledge of Baltimore and Ohio property has heretofore been very intimate that the company will presently restore rates through the entire country. This action following on the restoration of New York rates, and in connection with the fact that the construction account of the Garrett line has been closed through the country, has been taken on all hands as an indication of an approaching settlement of telegraph difficulties and a consolidation of interests.

.... What seems likely to be an important improvement in the composition of basic steel is now being carried out in Cleveland. The basic steel men have for some time been laboring to remove the stigma under which their metal lay in that Lloyds' Committee of Register had declined to insure in their A1 class ships built of basic plates, owing to want of uniformity in the metal. The unequal distribution of carbon was pronounced the cause of the absence of reliability. It has now been determined to substitute for the ferro manganese hitherto employed chromium pig-iron, and by this means it is believed that the difficulty will be banished. The discovery is a significant one, since, if by its adoption the objection taken to the Thomas-Gilchrist metal by Lloyds can be satisfactorily removed, like objections taken by engineers in other directions to the employment of basic steel for work requiring great reliability and strength should disappear, and the market for the metal be accordingly enlarged. Chromium pig iron can be produced at a cost not exceeding that of ferro-manganese, and it is probable that it may by and by be produced even cheaper.

ELECTRICAL AND SCIENTIFIC

* * Randolph & Clowes, Waterbury, have started their new Harris-Corliss engine, and are busy changing their machinery. To heat their feed water they have a ational feed water heater.

* * To such a degree of perfection and effectiveness has astronomical photography now reached, that among its achievements is a photograph of the cluster in Perseus, showing stars down to the thirteenth magnitude. In this particular case the negative was obtained in fifty minutes with a 6.3-inch object glass of 83-inch focal length, the view being subsequently enlarged four times and reproduced by hello engraving.

* * The mountain meteorological stations of Europe are said to somewhat excel in their equipments and appliances anything to be found in the Western world. Among these appliances is a superior kind of arrangement, or apparatus, for the automatic registration of sunshine, the results of which are tabulated with reference to the period of possible sunshine for each day, the record being so much per cent. of this total. On the mountain top on which the highest Austrian weather observatory is located, is another interesting arrangement, namely, a telephone wire extending from the very summit down to the village below, this wire in the summer being suspended on poles, while in winter, on account of the fierce winds, it is laid upon the snow, the latter proving a good insulator, as the apparatus works satisfactorily under these conditions. The French, it appears, have the highest meteorological station in Europe, and their two largest observatories are, it is claimed, the best appointed in the world. Much is expected of the recently established station on Ben Nevis, Scotland. This mountain is the highest in Great Britain, and is close upon the sea coast, as well as in the track of the great south-westerly storms which have such an important influence on the weather in the British Isles—a situation, therefore, peculiarly favorable.

* * William P. Hunt, the proprietor of the South Boston Iron Works, where heavy iron cannon are cast, was in the city during the week. He has been paying a visit of inspection to the great iron and steel works in Pennsylvania, with a view of enlarging his experience and possibly his works. He remarked that he regarded the Edgar Thomson Steel Works, near Pittsburgh, as marvelous in their extent and excellence. Among other things he said: "These works turn out enormous quantities of steel rails. They have five or six blast furnaces where they make the pig iron and eight or ten cupola furnaces for mixing the iron, besides their converters and other processes for treating the metal before it reaches the completed state. I watched them turning out rails with my watch in hand. In some instances they brought out a rail in twenty seconds. The steady average, I think, would be about two rails a minute. It was a marvel to me how they could handle all the vast quantity of material that was required for this work. They use 2,000 tons of iron ore a day, 1,000 tons of coal and large quantities of limestone to turn out 1,000 tons of pig iron. In all they handle nearly 5,000 tons of material a day. It is successfully done through organized and systematized division of labor, but it is wonderful nevertheless."

* * The *English Mechanic* has the following concerning small accumulators: "You can make one out of the wood of an ordinary cigar box, but mahogany or oak would do better. Soak the wood for a few minutes in melted paraffin wax, made very hot (after having cut the pieces to required shape and bored all necessary holes), and put them together by dovetailing, or very thin brass screws. The right size of the latter is not kept at most ironmongers. You would have to write to Nettlefolds, or some other manufacturers, for them; they would be ½ inch, and as thin as possible. Dimensions of box may be 6 inches by 3½ inches, by 1 inch outside. It must have a cover with holes for the connections of plates to come through. To get a good light, you would almost to a certainty require two cells, as I do not think there is any carbon filament lamp made which will light properly with only two volts. I tried to get such a one about twelve months ago, but found the best then attainable to require nearly three volts, though sold as a two-volt lamp by one of the greatest electrical corporations in the country. Much improvement, however, may have been made since then. For plates, two strips of lead sheet about $\frac{1}{14}$ inch or less in thickness, one of which should be completely sewn up in best thin flannel. Box should be lined with hot pitch, or melted india-rubber, but if it is well made, several coats of paraffin wax will do. Lid must be sealed on with pitch or india rubber, and have filling aperture closed by wooden plug. You would find two cells the size of the above much more satisfactory than one box divided into two cells, and it would be well for you to buy or make out of gutta-percha tissue a small india-rubber bag to hold the cell, in case of a drop or two escaping. Very neat and safe little cells can be made by cutting the tops off two medicine bottles, of such a size as to fit one within the other, leaving sufficient space for the plates, which, if of plain lead, must be "formed." See back numbers. I sent in a sketch of an electromotor last week in reply to a query, but as it contained a diagram requiring a woodcut, it was not in time; you will see it next number."

Two Interesting Electric Light Stations.

The central station at Milan, Italy, a view of which is given in Fig. 1, is running 8,000 incandescent lights of the Edison system. This station is one of the three—New York and London being the others—in which are used the largest dynamos, the capacity being 12,000 lights each. In Fig. 2 is presented a view of the Harrisburg station, which is a model incandescent station, with a capacity of 4,800 lights, exclusive of reserve. The station, as appears, is particularly neat and complete.

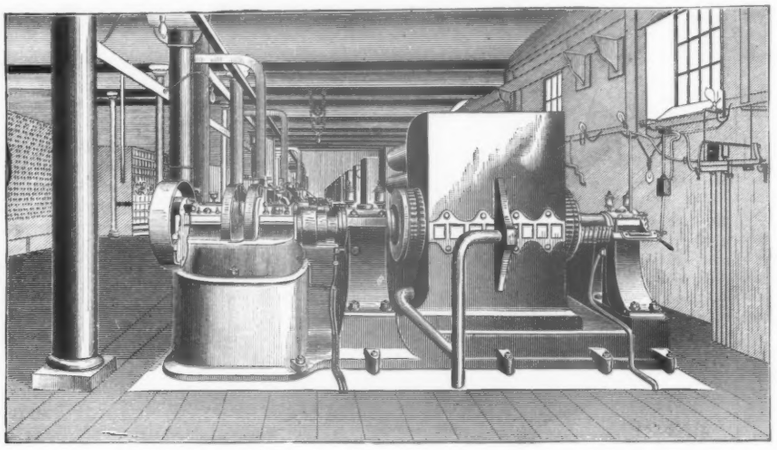


FIG. 1.—MILAN (ITALY) STATION OF EDISON ELECTRIC LIGHT COMPANY.

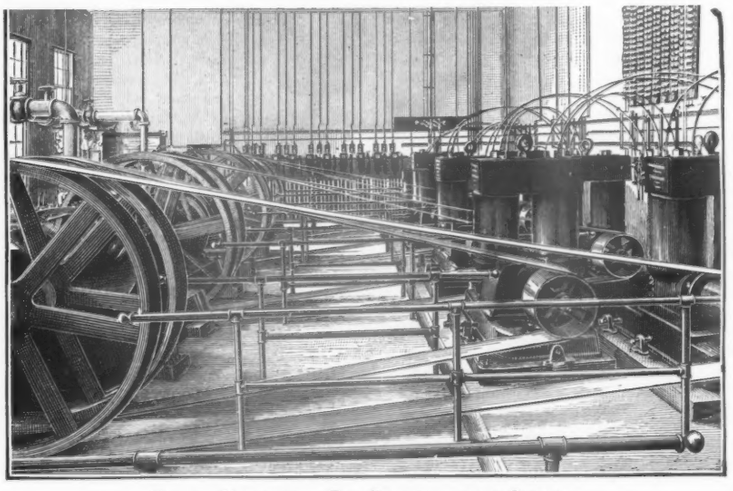


FIG. 2.—HARRISBURG, PA., STATION OF SAME COMPANY.

A Telegraph Operator's Innocent Blunder.

Many amusing mistakes are made by strangers who stop at boarding houses in Albany and forget the number at which they have engaged board. "In the vicinity of the Medical College," a telegraph operator said to a reporter, "are a number of houses built exactly alike. A few years ago a young 'lightning slinger' came here from Canada and secured a night position in the Western Union. He wandered up to Eagle street and engaged board by the week. After dinner he went to take a survey of the town, returning at 6 o'clock for his supper. He had forgotten the number of his house, but, looking down at a basement dining-room, he was convinced that he saw the same waiter who served up hash to him at dinner. He therefore ascended the steps, placed his hat upon the rack in the hall and descended the stairs to the dining-room, where he seated himself in a chair at the end of the table.

"The lady of the house had not been called to tea and the servant girls stuck their heads out of the kitchen door in a manner that appeared 'flirty' to the youthful Kanuck. But thinking he was a guest of the family, in somewhat of a hurry, they brought out all the delicacies of the season. As the would-be boarder was leaving the table the mistress approached him and inquired whether he was a guest of her husband. 'No, ma'am,' replied the operator, 'I am boarding here.' She insisted that they took no boarders, and he left, a supper ahead."

A Talk With a Plater.

"I gold, silver or nickel plate anything from a lady's pin to a brass watch," said a plating mechanic. "Gold plating is cheap now-a-days, as compared with former years. What are the principal articles plated? Watches, rings and other articles of jewelry. I will put a gold plate on a watch guaranteed for a year for $3.50, and not so good a plate for $2. Rings cost 25, 35 and 50 cents each to plate with gold. If you will step this way I will show you how plating is done."

The reporter's informant led the way to a rear room containing a dozen electric batteries to which were attached thin steel wires. On a bench were small cups containing liquid gold, silver and nickel. The gold used is 24 carats fine. To illustrate the process the operator took a silver ring and after washing it in a preparation, twined one of the wires attached to the batteries around it. The electricity was then turned on and the ring dipped in the liquid gold. Instantly the ring assumed a bright and red color and this was succeeded by a golden hue. In less than two minutes the ring was taken out with a sufficient gold plate to last a year, or at least so said the operator. Spoons, knives and forks, and in fact everything imaginable are plated in the manner described. There is big money in the business, as but little gold is used in the plating process.

"I can so heavily plate a watch that acid won't touch it," said the plater. "Bogus or heavily gold-plated watches are frequently palmed off by unscrupulous jewelers on customers. Confidence men often find a plated watch a means of earning a dollar when times are dull. Two months ago I plated a silver watch probably originally worth $10, for a customer, and charged him $5 for the job. A week or so ago he called on me and said that he had pawned that identical watch in a Brooklyn pawnshop for $40. No doubt the watch was plated heavier in some places than in others, and incase the pawnbroker tested the watch, which is unlikely, he did so on the heavily plated parts."

Presentation to an Electric Light Manager.

Yesterday Mr. Homer J. Goff severed his connection with the Merchants' Electric Light and Power Company, of Boston, as general manager, having already resigned that position, upon learning which the employes of the company and several of his friends presented him last evening with an 18 carat (58 pennyweight cases) gold watch, the works of which are of the highest grade made by the Elgin Watch Company. Engraved upon the watch is the following inscription:

"Presented to Homer J. Goff
By his friends and employes of the Merchants' Electric Light and Power Company,
Boston, Oct. 13, 1886,
On his retirement as general manager."

Mr. Goff has been in the service of the Merchants' Company since its organization some four years ago, at first as collector, then as assistant general manager, and for the past two years as general manager. He has been a most efficient and faithful officer, and has made many friends during his term of service, and has especially endeared himself to the men in the employ of the company under him, as the valuable gift of remembrance by them testifies. Mr. Goff, after a few weeks' vacation, will connect himself with the business of the American Electric Manufacturing Company, of New York, of which his brother, Mr. Edward H. Goff, is president and general manager. His friends in Boston wish him the best success in his new field of labor.—*Boston Herald, October* 14.

Digest of U. S. Patents on Storage Batteries.

REFERENCES TO FOREIGN PATENTS OBTAINED THEREON.

(THIRTEENTH PAPER.)

1885.

316,408. April 21, 1885 Filed June 25, 1883.
W. A. Shaw, Brooklyn, N. Y.

The electrodes are made by casting ingots of lead with grooves or perforations, which are subsequently filled with an active material, which also covers the surface; such ingots are rolled, heat being applied at the time until the desired thickness of plate is obtained.

The claims relate to the method of manufacture as described.

316,409. April 21, 1885. Filed June 25, 1883.
W. A. Shaw, Brooklyn, N. Y.

The electrodes each consist of a central conductor of conducting metal in the form of a rod, upon which is threaded a number of disks of metal coated on both sides with active material—and between the active disks are placed disks of porous fabric, such as paper or the like.

316,533. April 28, 1885. Filed Aug. 23, 1884.
French pat., No. 141,499. Aug. 23, 1881.
Belgic pat., No. 56,179. Nov. 9, 1881.
English pat., No. 5,104. Nov 22, 1881.
George Fournier, Paris, France.

The electrodes consist of rectangular metallic frames divided into subdivisions, and in which is placed a paste composed of a mixture of glycerine or glycerine acid and one or more metallic oxides, capable of setting when mixed therewith. The compound is said to be readily reducible. Such electrodes may be employed in primary or secondary batteries.

317,487. May 12, 1885. Filed July 5, 1884.
French pat., No. 153,393. January 27, 1883.
J. J. Barier, F. Tourvielle and James E. Legay, Paris France.

Within a cylindrical vessel are placed a number of cylindrical metallic electrodes—of decreasing size one within the other.

The tubes are fluted or ribbed, or may be formed of coiled strips.

Within the interspaces of the fluting ribs, or strips, is packed an active material consisting of litharge, mastic of sugar, and platinized carbon.

318,828. May 26, 1883. Filed May 3, 1883.
English pat., No. 2272. May 24, 1881.
Cape Good Hope pat. March 25, 1882.
Indian pat., No. 62. April 18, 1882.
Swedish pat. April 21, 1882.
Victoria pat. May 1, 1882.
South Australia pat., No. 251. May 5, 1882.
New Zealand pat., No. 648. May 17, 1882.
Natal pat., No. 78. June 29, 1882.
Norway pat.. Aug. 15, 1882.
New South Wales pat., Oct. 18, 1882.
Denmark pat., Feb. 15, 1883.
Canada pat., No. 16,553. March 21, 1883.
J. W. Swan, Laureston, Kent, England.
Construction same as U. S. Patent No. 312,599. Feb. 17, 1885. Filed Jan. 18, 1885.
English pat., No. 380. May 24, 1881.

Claims for the cellular perforated plate perse, pat. No. 312,599, covering the plate and active material as a whole.

320,232. June 16, 1885. Filed July 26, 1884.
J. Du Shane, South Bend, Ind.

The electrodes consist of tubes of lead having a spiral groove on the outside. They may be combined with an active material.

—— The new station of the Thomson-Houston at Elmira, N. Y., is nearing completion. The work, under the supervision of G. M. Randall, is being rapidly pushed.

—— Mr Fred. Rogers, formerly electrician of the U. S. Company at Elmira, N. Y., has resigned, and accepted a position in the same capacity with the Thomson-Houston Company at Fulton, N. Y.

Underground Work in Detroit.

At Detroit the Edison underground system is being put down. The pipes are large-sized gas pipes and the wires, twisted in cables, are run through them. Every twenty feet there is a curve in the cables to allow for contraction in cold weather and at these points are what are called coupling boxes. It is from these boxes that the single wires necessary to supply a building will be run through a small pipe. Connection can be made at any time with any building as easily as gas can be carried into a store or residence. The greater number of pipes and cables leading from the depot are called feeders. They carry the current to large junction boxes, located at convenient points, and from these junction boxes the supply current is carried in four directions, half way to other junction boxes The incandescent light alone will be supplied by the Edison Company. The work of laying the pipes and cables is being hurried as much as possible, and owing to the unfavorable weather last month and the approach of the cold season, every fair day is taken advantage of.

Somerville Eager for the Electric Light.

The Charlestown (Mass.) Gas Company, whose petition for permission to erect poles and run electric light wires in the city of Somerville was tabled at the last meeting of the Board of Aldermen, undertook this week to string its wires over the telephone poles, with the telephone company's permission. Finding it necessary in one or two instances to erect poles of its own, the gas company set out to do so. Its workmen were discovered by some one, who notified the Highway Committee, and the work was ordered to be stopped. There the matter rests at the present time. The Somerville Company, which expects to secure the right to put in an electric light plant, promises if it is successful to have the system in running order within thirty days. It is said that 1,000 subscribers are already pledged for the lights and that the selection of a site for a central station is about decided upon.

The Knights Were De [Electric] lighted.

During the conclave of the Sir Knights held at Elmira, New York, October 12 and 13, electric light decorations seemed to be the principal decoration. The most elaborate decoration was in front of the Rathbun House, being a Maltese cross composed of 32 incandescent lamps and when illuminated presented the most attractive appearance of any decoration ever seen in Elmira. It was designed and constructed by G. M. Randall, of the Thomson-Houston Company.

—— A joint stock company with $10,000 capital to establish an electric light plant has been formed at Willimantic. The Waterhouse system will be adopted.

—— Sewer gas is destroyed by electricity in London under a process devised by Hartley Fewson, and the efficacy of the plan is endorsed by several sanitary inspectors, health officers and others.

—— The Cleverly Electrical Works, Philadelphia, are doing an increasing business in their specialties of electric gas lighting attachments, which include the automatic burner, the pendant argand, the patent lift-over pendant, etc.

—— The Worcester Electric Light Company has leased land and will put up, as early as possible, a brick building, 95x50 feet with a monitor roof. The new building will be used as an electric light station. The engines and dynamos will be there.

—— An electric connection for chandeliers has been patented by Messrs. John P. Willets, of Jersey City, N. J., and Edwin R. Crolius, of New York city. It consists of insulated metallic rings, so held in yielding electric communication with wires carried by the swinging portion of the chandelier as to maintain an electric connection between the main line wires and the lamps, and also furnish an auxiliary bushing of insulated material, insulating the chandelier from the gas supply pipes.

—— The Sprague Motor Company have leased a factory on West 30th street, New York, for the manufacture of motors.

—— The Armington & Sims Company, Providence, R. I., have received the order for the engine to run the electric light in the Bartholdi statue, in New York harbor.

—— At a meeting of the common council of Ann Arbor, Mich., last week, a report was adopted in favor of lighting the city by electricity, 60 arc lights to be placed under the Thomson-Houston system.

—— Business in the city of Erie is reported good by all the manufacturers, and the Ball Engine Co. will this month get into their new buildings, as it has been impossible for them to keep up with their orders this year, notwithstanding they have run night and day."

—— The city of Alameda, Cal., is lighted by electricity. The plant consists of an 80 horse-power Buckeye engine and two dynamos, each capable of supplying 30 electric lights. The light is steady and brilliant, and each lamp is of 2,000 candle-power. The residents of Almeda were well pleased with the result the first evening, and many of them sat on the sidewalk reading while the works were in operation. Two more masts are to be erected, and the system will then be complete.

—— The Augusta, Ga., Electric Light Company has petitioned the Superior Court for an amendment to their charter, changing the corporate name to "The American Illumination Company of Augusta." Under the recent reorganization of the Augusta company the American Electric Manufacturing Company, of New York, became associated in the business, and is furnishing the new and improved machinery now being added to the Augusta plant, and the change of name is made in pursuance of this arrangement.

—— The Wainwright Manufacturing Company, 65 and 67 Oliver street, Boston, manufacturers of feed-water heaters, condensers, filters, expansion joints, radiators, and corrugated tubing, have been forced, by their numerous orders, to enlarge their plant, and are erecting an addition to their factory at Medford, Mass., of four stories, 31x78 feet, which will contain machine shop and radiator and corrugating departments. Their former building will also be utilized as a machine shop, as it has been moved. By this change they will be enabled to increase their product some three or four times, and thus meet the demands of their rapidly growing business.

—— The Edison machine shop, which began operations last week at Schenectady, will, as soon as all the necessary machinery can be put up, give employment to upwards of 1,000 men. The plant consists of two brick buildings, one 80 by 200, and the other 100 by 220 feet. A third building, 147 by 50 feet, will be erected. There are ten acres of land belonging to the property, which was purchased last June for $45,000—about half its value. The Edison company consists of Thomas A. Edison, Charles Batcheller, John Krensi, H. M. Liver, Samuel Insull and J. Pierpont Morgan, and has a paid capital of $150,000. The business is the manufacture of machinery, shafting, pulleys and hangers, and all kinds of electric light apparatus, except lamps.

—— The Royal Electric Company, of Montreal, is under contract to supply the following gas companies with a certain number of lights: Ottawa, 360 lights; St. Thomas, 50 lights; Chatham, 50 lights; Moncton, 40 lights; St. John, 150 lights; Woodstock, N. B., 50 lights; Fredericton, N. B., 40 lights; Winnipeg, 40 lights. The following cities are also using the Royal Electric Company's system: Toronto, Hamilton, St. Catharines, Dunnville, Galt, London, Owen Sound, Kingston, Napanee, Peterborough, Brampton, Huttonville, Quebec, Halifax, Charlottetown, St. Johns, Newfoundland. The company are making arrangements to supply private dwellings and stores with the incandescent light. There are two systems suggested for regulating the consumption and cost. One is to use meters, and the other is to take the consumer's average gas bill for the past two years, and be guided by them.

ELECTRIC LIGHT NEWS

—— The Bristol Electric Light Company, Bristol, running both arc and incandescent, has its new Armington & Sims engine in operation and it gives very fine results.

—— Yund, Kyne & Kennedy will soon put in an electric plant in their knitting mill at Amsterdam. There will be 75 lamps of 16 candle-power.

—— Sowden, Elder & Wright have commenced the installation of a Wood-American electric light plant at the Manchester Locomotive Works, Manchester, Mass.

—— The Cleveland Electric Light Company increase their plant regularly about once in six months, and have added a sixth engine of 60 horse-power made by the Westinghouse Machine Company.

—— At New Orleans the wires for incandescent electric lighting are being put up in the post office, and will be extended throughout the entire building. The lights will be in operation in the building on the 9th of December.

—— The contract for enlarging the Woonsocket Electric Light Company, Woonsocket, R. I., so as to use incandescent lamps, has been awarded to the Jarvis Engineering Company, 61 Oliver street, Boston. It will put in another 150-horse-power steel tubular boiler set with the Jarvis Furnace, and a 60-horse-power Armington & Sims Company engine.

—— The celebrated waterfall of Teverone, which Horace calls "præceus Anio," has been utilized for the production of electric light for the city of Tivoli. Two dynamos of 100 horse power have been set in operation, and others are being fitted up, and the illumination of Rome is contemplated. The excavations and canals are conducted under the house of Macenas.

—— It was to Henry O'Reilly, who has just died, that a New Jersey railroad forty years ago refused permission to erect posts and build a line of telegraph along its road between Philadelphia and New York. The frank and absurd reason given was that the telegraph would interfere with travel by enabling persons to transact business by its means instead of using the railroad.

—— The New York Safety Steam Power Company, builders of steam engines, No. 30 Cortlandt street, New York city, reports its trade as being good at the present time, and it is filling large orders for its engines, many of them being used for electric lighting purposes. This company carries on a very large business in its line. Its agent, E T. Copeland, is well known as an authority on steam.

—— The objection to the incandescent light in mines that it gave no indication of fire-damp has been removed by placing two together, one of colored and the other a clear light. A mercury contact, subject to the pressure from diffusion in an unglazed porcelain pot, allows the clear light to burn in a good atmosphere, but lights the colored one in fire-damp.

—— Professor Chon, of Breslau, the eminent oculist, has recently touched upon the influence of electric lighting on the eye-sight. He remarks that as diffused daylight is best for the eye, our artificial lighting should aim at a similar diffusion. Artificial light should not dazzle nor flicker, and it should be abundant without heating the eye. Glow lamps should never be looked at unless blurred by ground-glass shades, because of the intense concentration of light on the line of the filament. The electric light was, according to Professor Chon, greatly to be preferred to any other for reading or writing by, if it be steady and abundant.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING OCT. 12, 1886.

350,482 Electric lighting system; Philip Diehl, Elizabeth, N. J.

350,515 Underground electric cable; Benezette Williams, Chicago, Ill.

350,519 Cut out for electric lamps; Leonidas G. Woolley, Indianapolis, Ind., assignor to Henry H. McGaffey and Chester Bradford, both of same place.

350,548 Universal electric damper and fire alarm; Edward A. Morley, Lee, Mass.

350,615 Printing telegraph; Charles L. Buckingham, New York, N. Y.

350,616 Printing telegraph; Charles L. Buckingham, New York, N. Y.

350,617 Printing telegraph transmitter; Charles L. Buckingham, New York, N. Y.

350,621 Galvanic battery cell; Luis Drescher, New York, N. Y.

350,626 Hotel call fire alarm and indicator; Albert T. Hess and Hans A. Stoltenberg, Des Moines, Iowa, said Stoltenberg assignor to said Hess.

350,634 Signaling apparatus for police telegraph; Lewis H. McCullough, Richmond, Ind., assignor to the Richmond Fire Alarm Company, same place.

350,644 Transmitter and sounder; George W. Stewart, New York, N. Y., assignor of one-half to Stephen J. Cox, same place.

350,668 Electric motor; Philip Diehl, Elizabeth, N. J.

350,715 Telephone circuit; John A. Barrett, Brooklyn, assignor to the American Telephone and Telegraph Company, New York.

350,728 Electric motor or generator; Frank E. Fisher, Detroit, Mich.

350,754 Regulator for dynamo-electric machines; Osborn P. Loomis and Henry W. Cooley, Lynn, Mass.

350,772 Telephone transmitter; George L. Roberts, Boston, Mass., assignor to the American Bell Telephone Company, same place.

350,790 Railway signal; Pierson J. Wicks, Greenpoint, N. Y.

350,804 Fire alarm telegraph system; Sidney A. Chase, Evart, Mich., assignor of one-half to William R. Mapes, same place.

350,823 Apparatus for protecting safes and vaults Joseph Fleckinger, Allegheny, Pa.

350,828 Machine for winding armatures; Lucian B. Jones, Bedford, assignor to the Forsaith Electrical Machine Company, Manchester, N. H.

350,882 Multiple call-box; Charles Hermann NewYork, assignor to William J. Mathewson, Brooklyn, N. Y.

Parties Intending to purchase Electric Lighting Machinery, should consult
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A. U. FOWLER, C.E., was Examiner in the U. S. Patent Office from 1880 to 1886, in the Interference and Electrical Divisions.

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Fig.259

PHOENIX GLASS COMPANY,
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Fig.255
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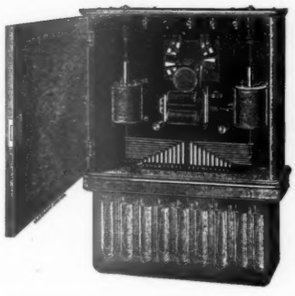

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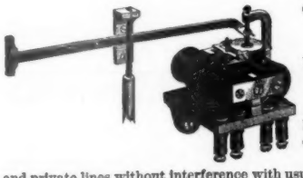

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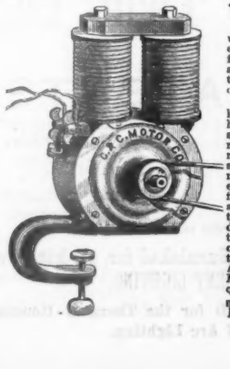

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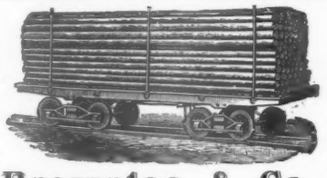

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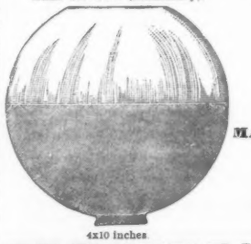

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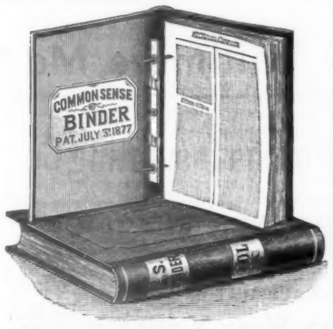

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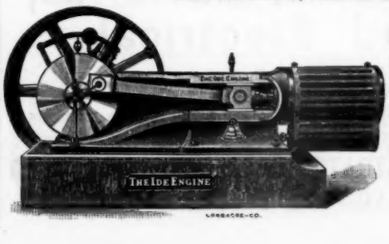

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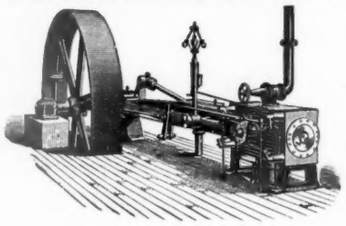

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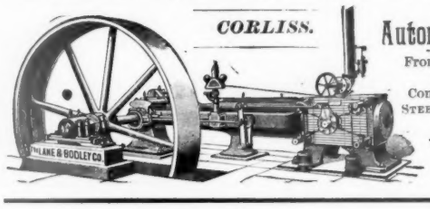

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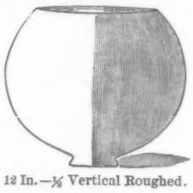

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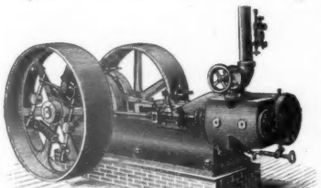

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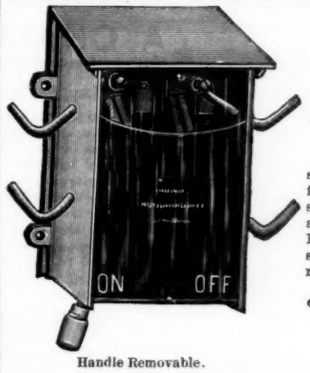

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This system of Electric Lighting is the development of a series of inventions and discoveries of James J. Wood, Electrician of the American Electric Manufacturing Company, of New York, who has devoted himself to the discovery of new and original methods by which **an improved system of arc lighting,** with perfect automatic regulation, superior in electrical efficiency, more economical in construction and operation than other systems, could be obtained

Mr. Wood has succeeded in his efforts, and has produced a Dynamo-Electric Machine, manufactured in various sizes, with capacity of 1 to 50 lights of 2,000 candle-power each, which is superior to any Dynamo Electric Machine ever before invented, and which stands **the severest tests to which such machines can be subjected.**

Mr. Wood has also invented a set of **Lamps** which are **perfect** in their electrical and mechanical construction. In operation they are **free from hissing and frying noises,** and do not **cut out of circuit,** or allow the **carbons to slip by** and extinguish the light—defects so objectionable in other systems.

☞ The AMERICAN COMPANY cordially **invites investigation of its System by Scientists, Electricians and Mechanicians,** as well as by all who contemplate buying or using Electric Light Apparatus.

THE SPECIAL ADVANTAGES

claimed for the AMERICAN SYSTEM of Arc Lighting are

THE MOST PERFECT IN PRINCIPLES OF ELECTRICAL AND MECHANICAL CONSTRUCTION.

For **Completeness** and **Simplicity** of construction, **Durability** and **Economy** in operation, **Steadiness** and **Quality of Light** produced, and **Perfection in Automatic Regulation,**

IT HAS NO EQUAL.

The ***Wood Automatic Regulator*** is Entirely Original, Absolutely Perfect in Operation, and is the **Only Perfect Automatic Current Regulator** ever invented, the pretensions of rival companies to the contrary notwithstanding.

The Wood Automatic Regulator is the **only one** made which will permit the turning on and off of all the lights in circuit and allow the dynamo to **run any length of time on a short circuit,** or any number of Lamps—from **one** upward—on any size or capacity of machine without injury to the machine, and with corresponding diminution of power.

The cost of oil and Commutator Brushes is **reduced to a Minimum,** one set of Brushes lasting for months without readjustment.

The general care and expense of running and maintenance of the American Machine and Lamp is **far less than in any other system.**

The **absolute safety** of Armatures **from burning** (the great difficulty with other systems, and which makes maintenance so expensive), is a feature of incalculable value in the American apparatus.

The Wood Armature is now so constructed that it is **impossible for it to burn out, or for copper or other metallic dust to collect on it, to form a short circuit,** while the powerful circulation of air through the armature is not interfered with.

The Field Magnets are constructed so that it is impossible to form a short circuit that will burn them, or in any way affect the light.

The American generator occupies less space, weighs less, and requires less motive power than any other capable of producing an equal number of lights.

There is no flashing or firing of the commutator, and consequently no loss of energy and wearing of the parts from this cause. Its commutator requires no oiling, air blasts, or other attention than to be kept clean. Its extreme simplicity enables it to be operated with less skill and attention than are required by other systems.

The foregoing are bold statements, and we are ready to substantiate them in every particular. Comparison and competitive tests with other systems of Electric Lighting is invited. We stand ready to meet any known system of Electric Arc Lighting in open and fair competitive tests, upon all points of superiority claimed for our apparatus, wherever and whenever a sale is guaranteed to the winner in the contest.

☞ ***Local Electric Lighting, or Gas Companies, either New or Old, should INVESTIGATE THE AMERICAN SYSTEM before buying New Apparatus elsewhere.***

A CHALLENGE.

To All Whom it May Concern:

The American Electric Manufacturing Company only makes such claims regarding the superior merits of the American System as its officers are convinced can be fully maintained in open and fair competition with any known system of Electric Arc Lighting manufactured in this country.

With a view to having this question fairly, definitely and authoritatively settled between the various manufacturing Electric Light Companies now in the market (all of whom make statements regarding their respective apparatus which are, and always will be, more or less misleading to intending purchasers until full and complete tests are made and the results published to the world), the American Company hereby offers the following

CHALLENGE

to any and all manufacturing Companies of Electric Arc Light Apparatus in this country, to meet in a 30 days' competitive test, in all the points of superiority claimed for the American (Wood) Dynamo Machine and Lamp.

Each Company entering for the test to deposit the sum of $1,000 cash, in such bank as may be mutually agreed upon by the contestants, as an entry or admission fee, for the following purposes, viz:

1st.—Defraying the expenses of the test.

2d.—The Balance to belong to the winning company, which shall immediately donate it to the Charleston Sufferers.

This challenge is made to all Manufacturing or Parent Companies of Electric Arc Light Apparatus in the United States, but is made with especial reference to the Thomson-Houston Electric Company, of Boston, Mass. This challenge is open for 30 days, from October 1st, 1886, at the end of which time a representative of the American Company will meet the representatives of such other companies as signify to us their acceptance of this challenge, for the purpose of arranging time, place and details for the competitive test.

AMERICAN ELECTRIC MANUFACTURING CO.,

NEW YORK, October 1st, 1886.

By EDWARDS H. GOFF, *Pres't and Gen'l Manager.*

Special Attention given to installing Isolated Plants for Mills, Factories, Shops, Railroad Buildings, and other Buildings where large spaces are to be illuminated.

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The Incandescent Electric Lamp is the universally acknowledged invention of Thomas Alva Edison, and is covered by fundamental patents granted to him January 27, 1880, No. 223,898; May 4, 1880, No. 227,229; and July 20, 1880, No. 230,255.

These patents, as well as some 300 additional detail and system patents, are all owned by this company.

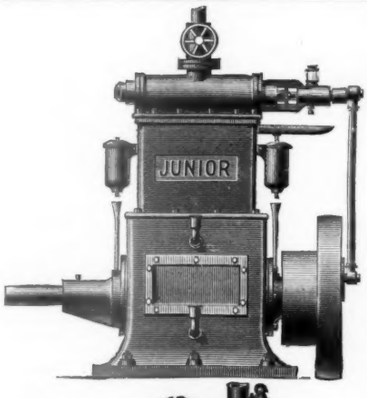
All forms of incandescent lamps as well as a great majority of the 'Detail" and "System" devices offered by others than this company and its licensees, infringe the above mentioned patents, and all persons using them render themselves individually responsible for such unlawful use, and all the consequences thereof, and liable to suit therefor.

A CARD TO THE PUBLIC.

The Edison Electric Light Company having instituted suits on its patents, must decline to substitute the advertising columns of the press for the courts for the purpose of their legal interpretation. Mr. Edison's carbon filament patent of 1879 covers broadly the modern incandescent lamp. The claim that this patent has ever been in litigation in the United States Patent Office is absolutely false. In Germany and England, this fundamental patent has finally prevailed against all infringers thus establishing the fact that Mr. Edison's great invention has been nowhere anticipated; *Ergo*, a like result must follow in the United States. The straining and distorting of these facts, together with the violent effort to interweave with them certain minor and IRRELEVANT CASES for the purpose of fraudulently posing before the public as joint heirs with Mr. Edison in the fruits of these patent decisions, only indicate the DIRE EXTREMITY of those who are thus gradually becoming ENVIRONED by due process of law.

THE EDISON ELECTRIC LIGHT COMPANY

By EDWARD H. JOHNSON, Vice-President.



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New Illustrated Pamphlet will be sent on application.

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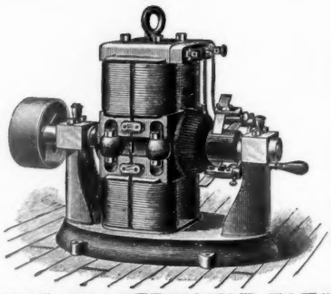

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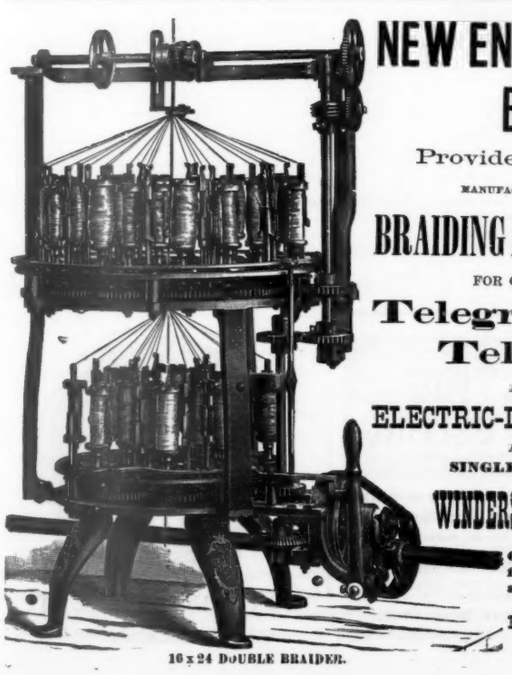

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